Old Houses at Wellingboro, England
Hy. Erle Cooper

From The American Annual of Photography, 19[illegible]

Stratford-on-Avon Church

R. S. Bruce

From The American Annual of Photography, 190[illegible]

Saxon Mill, Guy's Cliff, Warwick, England

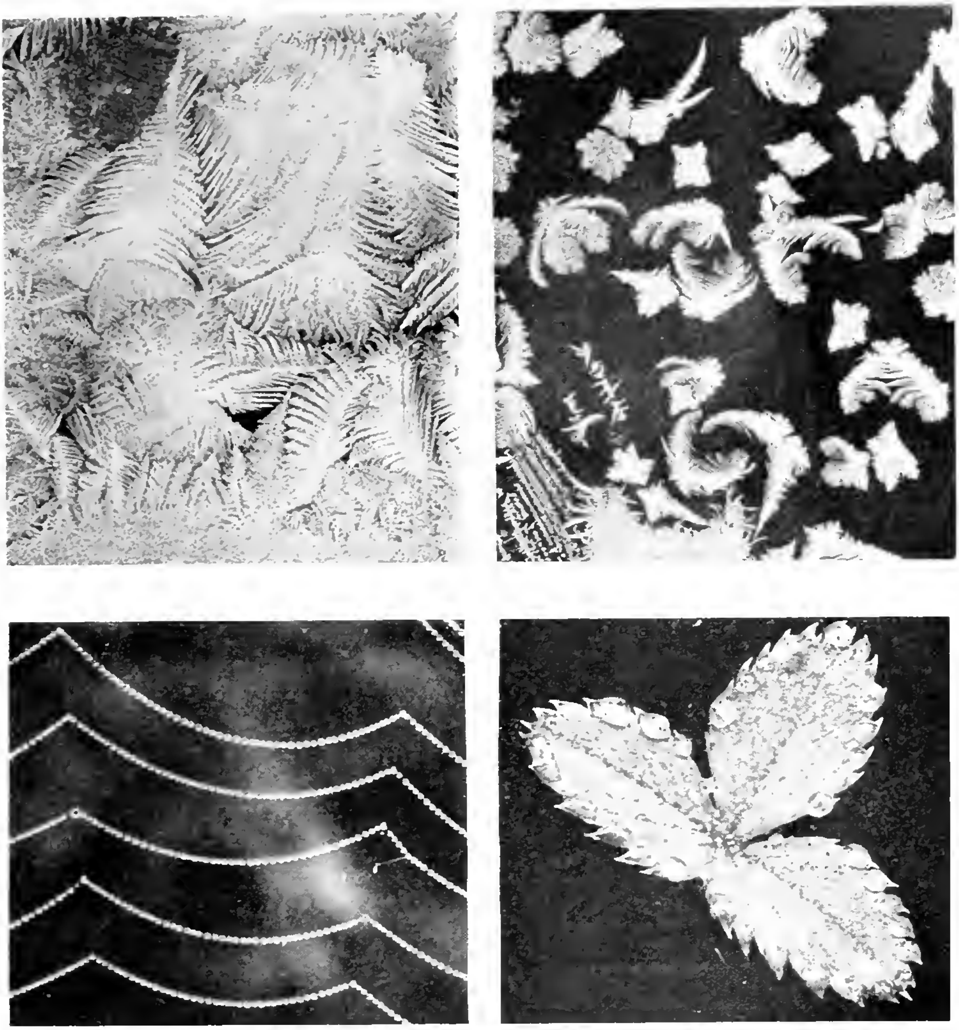
R. S. Bruce

From The American Annual of Photography, 1908

The First Violin

A. B. Hargett

From The American [illegible]



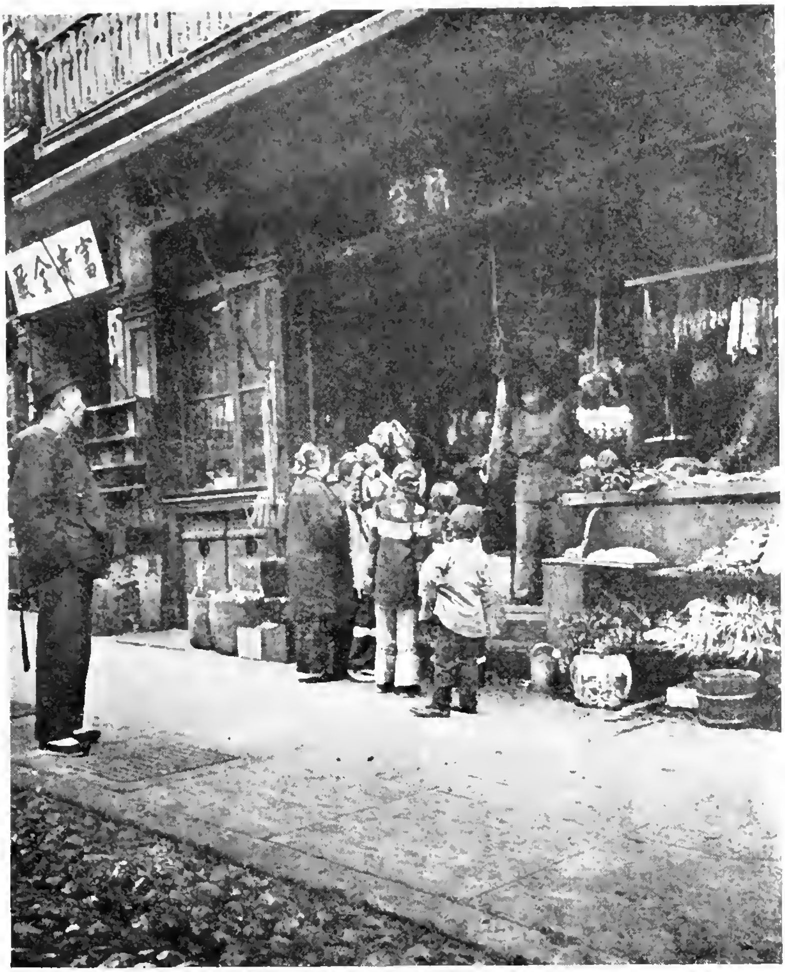
Upper: Frost Forms on Window
Lower: Dew on Spider's Web and Strawberry Leaf
Wilson A. Bentley

From The American Annual of Photography, 1908

Lucerne

Dr. C. George Bull

From The American Annual of Photography, 1908



Old Chinatown, San Francisco
Dr. C George Bull
From The American Annual of Photography, 1908

Anticipation
Theodore F. Eitel

From The American Annual of Photography, 1908

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Photography by Flashlight

Since the publication of No. 29 of THE PHOTO-MINIATURE in 1901, the popularity of flashlight photography has made great progress amongst all classes of photographers, and as I find there is a strong demand for further information on the subject, I propose to devote the present monograph to a résumé of the chief advances in practical work which have occurred in the last seven years. The subiect will be brought up to date and most phases of it treated by the light of recent experiences. It is over forty years since the first photograph was taken by the illumination obtained from the combustion of magnesium, and today, as then, the problem before the photographer is how best to utilize that and its allied illuminants so as to dispense with daylight in his work, while at the same time he calls into use the simplest forms of apparatus in which to control these artificial substitutes for the solar rays.

The suggestion of Bunsen and Roscoe in 1859 that the magnesium light could be used in photography led to the introduction of a thin wire composed of the metal, and later the wire was made in the form of a ribbon. As I pointed out in No. 29 of this series, Brothers of Manchester copied engravings and took portraits and subterranean stereographs in this manner, and the late Prof. C. Piazzi Smyth also photographed the interior of the Royal Chamber in the Great Pyramid with magnesium. The ribbon subsequently gave place to the powder and many lamps were devised for its use. Then the magnesium itself was improved, changing from a coarse granular

mixture into a smooth powder of fine consistency. The plain magnesium is used today by many photographers in preference to compounds on account of the danger presently to be referred to, which attaches to the latter bodies. The flashlight compound was a product of the late sixties. It was prepared by mixing powdered magnesium with potassium chlorate and a metallic sulphide, such as antimony. The admixture of highly oxidizable substances with the magnesium increases its luminosity: and so flashlight compounds find adherents amongst practical men who claim for them greater combustibility, more intense illumination and less dust and smoke than magnesium alone will give.

Various Forms of Flashlight

Magnesium, then, is available in the powdered or ribbon form; it can be used alone or in combination with other sources of light, such as daylight, oil, gas, electricity, or acetylene. This also applies to aluminium. You can ignite the powder by itself: that is, in a simple heap or number of heaps; or through the media of ribbon, pellets, candles, touch papers, impregnated sheets of paper and in lamps of varied design. Its amenability to diversity of application is greater than that of the sun, electricity, acetylene or other sources of light, inasmuch as domestic interiors, at-home portraiture, studio portraits and groups, street views by night, architectural interiors, subterranean photographs, industrial works in progress, stores, warehouses, and a whole world of subjects, reveal themselves for treatment quite independently of daylight.

Prolonged Exposures

Note, too, that photography by flashlight need not of necessity be instantaneous. You can prolong your exposure indefinitely, within certain limits, and make intermittent or continuous flashes at will. To illustrate the wide range of possibilities in the system I cite two examples, drawn from my own experience. I have photographed a family group in the fraction of a second with five grains of powder: and I have also used the respectable quantity of thirty-two ounces to get the negative of a theater interior. The most modern development of flashlight photography exhibits itself in the form of an

electric flash-lamp by which one may make instantaneous portraits in the studio.

Rationale of Flashlight

The burning of magnesium in a bell jar of oxygen is a familiar class-room experiment. An intense bluish white light is produced and the compound known as magnesium oxide forms the residue of the combustion. This is the fundamental principle of flashlight photography. Atmospheric air not being pure oxygen—it is, of course, known to all that it is diluted with another gas, nitrogen—we get a light of diminished brilliancy when the magnesium is burnt in the ordinary atmosphere, and so various bodies are mixed with it in order than its actinic efficiency may be increased by the presence of oxygen and other accelerators, if I may so term them. For, as Mr. Rau, of Philadelphia, long since pointed out, anything which increases the heat of the burning magnesium will also increase the actinic light. The ribbon or wire burns comparatively slowly when ignited in the ordinary air, because the supply of oxygen is diluted; but it glows brilliantly when burned in a jar of pure oxygen. Hence, bodies which quickly and readily supply it with oxygen during its combustion increase its energy. But this increase of energy introduces the element of danger, or, in other words, the explosive catalytic, chlorate of potash.

Dangers in Mixtures

Chlorate of potash by itself is a harmless substance, but when it enters into flashlight compounds it becomes potentially explosive, although the other ingredients of the mixture may by themselves be perfectly harmless. The danger steps in when all are mixed together and subjected to concussion, so that, in compounding flashlight mixtures containing chlorates or oxygen-forming substances, all the ingredients should be powdered and dried separately, mixed together at the time of using, and then only in quantities for a single flash, as many of them are liable to go off spontaneously and when least expected. The mixing should always be done on a sheet of paper, with a slip of thin cardboard as a spatula; and even then used at arm's-length, so that if an accident happens no great injury will result. In this

monograph, however, I refrain from advising the preparation of flashlight mixtures and prefer to deal throughout with the commercial productions only.

Rapidity of Combustion

An essential condition for the rapid combustion of the powder is that nothing should intervene between the oxygen of the air and the surface particles of the metal. If, however, the metallic powder (and especially so when it is finely comminuted) is exposed to the atmosphere through being kept in a badly corked bottle, or screwed up in a piece of paper, the surface of the aluminium quickly gets covered with a coating of oxide, which, though it may be slight, will seriously interfere with its ready combustibility. A similar difficulty has been traced to a slight coating of grease rendered adherent to the surface of the particles in the process of manufacture. It has been proposed to get rid of this by heating the powder in a closed crucible provided with a small outlet to drive off the slight products of this oily matter. A simpler plan, perhaps, would be to digest it with benzol to dissolve away the grease and then to quickly dry and store it in air-tight receptacles.

Aluminium

Aluminium, I may point out, has one great advantage over magnesium. The latter in its finely powdered state readily tarnishes and becomes ineffective, so that when the other constituents of the flash powder attract moisture the magnesium must be protected from damp. On the other hand, aluminium powder will keep indefinitely at the ordinary temperature without oxidizing. But it must be in a very fine state of subdivision to be of photographic service, for whilst coarsely powdered magnesium is easily ignited, aluminium must be of the consistency of silver bronze — flour-like to the touch — before it will properly burn in gas or alcohol. It is found that a mixture of aluminium with magnesium in the proportion of 1:3, the other components remaining the same, gives an excellent flash powder. How quickly do these illuminants burn? In other words, what is the duration of a flash in normal circumstances, such for instance, as studio work? This question, of course, is one which can be answered only in general terms.

Duration of Combustion

The duration of the combustion in the case of magnesium powder, pure and simple, may reasonably be considered as a time which elapses between the arrival of the powder at the margin of the lamp flame — for the purposes of the illustration I assume that a stand lamp is being used— and its arrival on the other side of the flame. Granting a flame of the dimensions of four inches in height or breadth, I do not think I should be far wrong in roughly estimating that the exposure would be $\frac{1}{10}$th to $\frac{1}{50}$th of a second. In taking portraits, therefore, with so brief an exposure as this, it is improbable that the shock caused by the sudden flash could influence the nerves which control the expression quickly enough to allow them to alter before the flash was over.

The Camera

These preliminary considerations take us to a brief study of the apparatus and accessories essential for flashlight work. The camera ordinarily employed is the one to choose for flashlight work; but I, personally, prefer an instrument with a focusing screen; a spirit-level; a time and instantaneous shutter; and a stay for holding the tripod firm and steady, especially on a smooth floor. It is a fine safeguard against accidental kicks. Nothing is so annoying to the photographer as to find when he has made ready that a push or a kick has disturbed the apparatus. It does not sweeten the temper.

The Lens

I have nothing to say against the common advice that the lens in current use will probably answer the ordinary requirements of the flashlight photographer, but I insist that large-aperture lenses of anastigmatic form are, whenever obtainable, especially to be desired, as with the valuable property of rapidity of working they combine flatness of field, two obvious advantages where fine definition is sought. Portrait lenses of high intensity are, for their own special work, not to be excelled. On the other hand, lenses whose largest effective aperture is $f/8$. meet, it is true, most normal needs; but, for all that, the anastigmat affords such a valuable extra power that when you can get hold of one, do so; keep it, and use it. You will find it of great help on many occasions.

Focus of the Lens

The use of as long a focus lens as possible is advisable in small interior work by flashlight photography on several important grounds. One well-known worker points out that the two chief points on which the success of a flashlight photograph depends are, first, the use of a long-focus (i. e., narrow-angle) lens, and, second, the employment of two heaps of flash powder simultaneously ignited. These two things are very seldom paid attention to, and that is why flashlight photographs are usually so bad. A wide-angle lens is always bad for figure subjects. But, when out-of-doors, the amateur is frequently far enough away from his models for its wickedness to be inconspicuous: In a room he is brought close up to them, and then the wide-angle perpetrates its atrocities. Of course, the perspective given by a wide-angle lens is quite as accurate as that of a narrow-angle one. Its only fault is that it takes in a wider angle than the eye *sees*. It is true that the image on the retina is of a wider angle than that given by any wide-angle lens. But we *see* only a little bit in the middle of it a narrow angle and, if you cut a portion out of the middle of a picture taken by a wide-angle lens, the so-called "unnatural" perspective will be found to have disappeared.

Plates

Use extra rapid plates, and, wherever practicable, let them be backed. I write of plates but I wish it to be understood that the term embraces films. Plates or films—they should be of extra rapidity. It is axiomatic that the one thing most to be aimed at in flashlight work is rapidity and accuracy of exposure. In order to reach that end, large aperture lenses and rapid plates should be given a front place in the list of things the flashlight photographer mostly needs. I found them of enormous advantage in flashlight stereography of which at one time I made a speciality. The lenses I then used were Ross Symmetric Anastigmats working at *f* 5.6. The plates were Imperial Special Rapid, 200 H. and D. approximate. Flash cartridges sold by York Schwartz supplied the light. I took groups of from 3 to 10 persons in my dining-room, which measured 20 feet by 18 feet: and I got satisfac-

tory results by the ignition of a single flash cartridge. The lens I used when the 32 ounces of magnesium were burnt in the theater worked at *f*/6.3, and I was glad of its extra illuminating power. Eight lamps were distributed about the dress circle of the theater, which held 2,500 people, and the single flash gave me on development with metal and hydroquinone a well-exposed negative of the auditorium and proscenium on a 10 x 12 plate. A lens shade will prevent extraneous light from striking into the objective. Once more as to plates: Seed's Nonhalation Orthos are old favorites of mine; and I constantly use Hammer's and Cramer's. But if you already have a favorite plate in regular use it is wise, in the phrase of the time, to hang on to it.

Backgrounds, Screens and Reflectors

For small groups and portraits, which are often attempted by the worker in a humble way, one or two neutral-tinted screens and backgrounds are necessary. These may be either of paper or fabric. As deep shadows are to be avoided, reflecting surfaces of sheets of white paper or cardboard for directing light on to dark patches of the picture, if it be a domestic interior, should be at hand. The background should be darker in tint than the screen, and the latter need not be white, as is so often advised. If it is gray or brown, then the background must be distinctly the darker. There must be a marked contrast in tone or color between the two. The reason for this is that their functions are, to some extent, complementary. For the screen lightens up the shadow side of the figure or group, and the background throws it into relief. Avoid flatness as you would hardness. Do not forget, too, that in most cases you will be throwing your light down on to your group or sitter, and that heavy shadows will obtrude themselves in the lower part of your picture if some light be not directed there by means of white-surfaced reflectors inclined toward the natural shadows from a point situated outside the field of the lens. The use of a diffuser, too, between the light and the subject, if it be a portrait, obviates hard lighting and want of detail in the shadows, and prevents over-exposure in the high lights of the picture.

Lamps

The choice of a lamp is not an easy matter, simply because of the bewildering variety offered by dealers. We must know what we want. The essential features of any flashlight apparatus are as follows: It must offer a simple means of securing complete combustion of the powder used; it must give the maximum light efficiency with as little smoke and dust as possible; it must be portable, simple in manipulation and readily adjustable to any desired height.

Looking over the flashlight apparatus commercially available the various forms may be grouped in three classes. First, the simplest form of flashlight, such as the Eastman flashsheets, Flash cartridges, the Mills cartridge and the like. These contain a definite quantity of powder, can be used only once, and are ignited with a match, taper or fuse. Flash cartridges fitted with a time fuse, or used in a flash pistol or other equally simple form of holder and ignited by pressure on a trigger, are among the best of these varieties. Such apparatus is capable of a wide range of work, and, skilfully used, will produce satisfactory results, but obviously has a limited capacity.

Hand Lamps

Next we have hand lamps, designed for use in the hand but offering a larger capacity for serious work than the simpler forms already considered. Broadly speaking, hand lamps fall into two distinct classes: Those intended for use with pure magnesium only, and those intended for use with compound or explosive powders.

Magnesium lamps are usually, but not always, spoken of as magazine, closed, storage or blow-through lamps, the magnesium powder being stored or held in a reservoir or container, and, at the moment of ignition, blown through the flame in a fine spray. Thus a continuous "flash" or flame of a few seconds' duration may be made with a single charge of powder. Obviously, an explosive powder cannot be stored in any closed container or handled in close proximity to flame. Hence the rule: Never use anything but plain magnesium in a closed, or magazine, or storage lamp, even though it be described and sold as a "flash lamp." The *Prosch*

Storage lamp, the *Peerlees*. *Perfection*, *Newlite* and *Crown* lamps are good examples of this class. Lamps made for use with "flash powders" or, more properly, compound powders, are known as open lamps, the powder being spread or heaped on the open pan or tray (not confined). Such lamps require to be recharged for each flash. They differ widely in form and capacity. The *Luxo*, styles A and B, *Nichols Junior*, and *Spredlite* lamps are examples of this second class, using compound powders.

Stand Lamps

Stand lamps, or flashlight machines as they are often called, are generally intended for use with compound powders, and come in many different forms. Essentially they consist of a flat or curved metal powder-pan, mounted on a metal standard of light construction, and adjustable at any desired level within certain limits. In such lamps the compound is spread or heaped on the tray (according to the design of the apparatus), the charge being ignited by means of a percussion cap exploded by trigger operated by pressing a bulb, as in the *Eagle* flashlamp; or by blowing a small alcoholic flame through a blast tube, as in the *Nichols* lamp; or by blowing the compound into the flame of an alcohol lamp or series of lamps set in a row, as in the *Luxo* lamp, styles C and D. More elaborate forms are operated by electrical connection, this lending itself to the grouping of several lamps in batteries. To this class belong the Pingree and Thayer lamps used by commercial workers.

Choosing a Lamp

In the choice of a lamp the reader will naturally be most largely influenced by his probable use of the apparatus. Roughly speaking, almost any of the lamps in the market will meet all reasonable requirements for home work, small groups or interiors. In more serious work, where large groups and important social events are attempted the question of relative efficiency is a matter of vital interest. Simplicity and certainty in operation are desirable here, but the chief point is illumination — the larger the area of the flame the greater the efficiency of the lamp. Thus with some lamps a charge of ninety grains of powder will give a larger light area than can

be obtained by the use of half an ounce of powder with other lamps. In this detail, unfortunately, experts agree to differ, some preferring one and some another form of lamp construction as giving the desired flame area. The shape of the powder-pan plays an important part in the distribution of the flame: thus, some lamps give an extended flame about fifteen to twenty inches high, this wide distribution of the light tending to soft and diffused lighting effects; others, such as the *Eagle* lamp, "bunch" the light, giving a flame area about forty inches square, this area being secured in the case of the *Eagle* lamp by means of a powder-pan of peculiar design. In the *Nichols* lamp the arrangement of the powder-pan and its shield is such as to give a light area especially adapted for portraiture and small groups. The flame area given by a lamp is also of interest as influencing the size or capacity required for its use in a smoke-bag or the distance at which one must work in rooms hung with combustible draperies or curtains.

Avoiding and Removing Smoke

The avoidance and removal of smoke is one of the little difficulties in flashlight photography, which the worker on a small scale can easily surmount. Mr. F. J. Mortimer, in his book on magnesium-light photography, points out how a piece of apparatus can be easily constructed by the photographer himself, which will be found useful at times when the smoke nuisance has to be avoided. It takes the form of a square box, and no better type of box can be suggested for conversion than an ordinary tin biscuit box. The cover is removed and its place taken by a sheet of plain white glass sliding in grooves, or, if the whole of the middle of the cover is cut away, leaving only a narrow rim, this can be used to hold the glass in position. The box is used on its side, with the open end pointed at the object to be photographed. A small flap door opening outwards is necessary at the back to allow of the expulsion of air after the flash. This should have a loose hinge, and be weighted so as to fall back quickly and trap the smoke. Either flash-powder on gun-cotton or a flash-lamp can be used inside the box, and after the flash it can be taken out into the open air and the smoke allowed to escape.

It is then ready for use again, or a couple or three can be kept going if a series of photographs are being taken —as for instance at a fancy-dress ball, when each guest is photographed separately in an ante-room. If flash-powder is used, it can be ignited by inserting a lighted taper through a small hole in the side of the box. If a lamp is employed, the rubber tube can be led out through a similar aperture.

Smoke-Bags The production of flashlight photographs of banquets and other gatherings of numbers of persons, is surrounded by many drawbacks, not the least of which is the diffusion about the hall or building of the gases, smoke and magnesic oxide evolved by the flash. Indeed, the discomfort and inconvenience caused in this manner, not to speak of the assumed danger, has often laid a prohibition upon the work so that it is no uncommon thing to hear that it is forbidden in many public buildings to obtain flashlight photographs of important gatherings and ceremonies. But the use of a smoke-bag for trapping and disposing of the products of combustion generally obviates such restrictions; the well-known smoke-bag systems of Lawrence and other photographers meeting, as our readers know, with great success. A smoke-bag, besides diffusing the light, overcomes the evils of smoke, smell and dirt, and should be an essential item of the professional flashlight photographer's equipment. Smoke-bags are placed on the market by several firms, including the Prosch Company and the Crocker Company, of Chicago. The latest form of the device is the Eagle Flash-Bag (George Murphy, Inc., New York). By the courtesy of the inventor, Mr. Fraley, I am enabled to place before the reader some details of its construction, which will enable him to make one for himself. The Eagle Flash-Bag consists of a rectangular envelope of close-woven, fireproofed unbleached sheeting, suspended on four cross rods attached to a vertical standard, and having on top a folding flap of peculiar construction which expands with the released gas, smoke and magnesic oxide, and automatically acts as a cut-off from the rest of the bag. After exposure the bag and lamp can be removed bodily from the scene of operations, the

smoke and other products having been completely trapped. The whole apparatus, if neatly made, should be extremely portable and fold up into a small compass.

Making a Bag

To construct such a bag: Provide a wooden or metal standard from four to six feet high, or any desired length. The standard may be of telescopic form and adjustable to various heights. To the top of it affix an inverted juvenile wooden top in which bore four holes, for the reception of the metal cross rods. These rods support the flexible bag, which should be weighted with metal or lead sinkers weighing four or five ounces each to keep it in position. The dimensions of the bag should, of course, be chosen according to the size of the lamp with which it is used. For the Eagle lamp they should be 5 feet wide, 6 feet deep and 3 feet high, the top fold measuring 2½ feet. For the Nichols lamp they should be 4 feet wide, 3 feet deep and 5 feet high, the top fold measuring 2½ feet. The width of the flash-bag should always be 2 feet more than the tray of the lamp. For magnesium lamps the bag should have a closed bottom with an opening in the back, about one foot from the bottom, large enough to allow the lamp to be inserted and held therein during the exposure. Care should be taken to have the bag sufficiently large for the flame. To fireproof the bag, take ammonium phosphate, 5 ounces; common soap, 2 ounces; water, 90 ounces. Soak for half an hour at 120° Fahr., and hang up to dry. Well wash and fireproof the bag after every four or five exposures or it will be clogged up with dirt from the flash-powder and will not pass sufficient light. Not more than half an ounce of powder should be used in the bag.

"Dega" Electro-Flash Lamp

The "Dega" Electro-Flash Lamp, which has just been place on the English market by the manufacturers of Blitzlicht, referred to on page 13, places a new power in the hands of the flashlight photographer. Externally the apparatus resembles a pocket electric lamp. A dry-battery system is contained in the casing and the top being opened, two metallic studs are seen, between which a piece of the fuse wire is stretched, the thickness of this being so adjusted that on pressing the

button of a contact piece at the end of a flexible cord, the wire is rendered incandescent: hence flash-powder piled upon the wire becomes ignited from the bottom. In using the apparatus, the fuse wire being stretched between the terminals and the requisite quantity of "Agfa" powder being piled on the wire, the exposure is made. The complete apparatus with fuse wires, charged batteries, flexible cord, powder, etc., is marketed in England for two dollars and fifty cents.

Compound Powders

In using compound powders, the question of quantity of powder to use becomes one of great importance. Lens aperture, plate speed, and distance of lamp from subject are variable factors which influence the quantity. The largest available aperture of the lens should be used, and the lamp placed as near as convenient to the sitter or group, always, of course, keeping it out of the field of view included by the lens. The use of a screen between sitter and lamp roughly increases the exposure by a third, and consequently proportionately more powder must be used. If screens of two- or three-fold muslin are used, the quantity of powder must be further increased. In "Rembrandt"-lighting a white cheese-cloth screen being placed between the subject and the lamp, with a reflector on the shadow side of the face, two level teaspoonfuls of Luxo suffice, the lens being at *f*/8, extra rapid plates in use, and the camera five feet from the sitter. In "line-lighting," five; in "edge-lighting," three, and in "full shadow" three teaspoonfuls of the same powder are required, whilst for a group of three or four persons, with a white screen between group and lamp, three level teaspoonfuls of Luxo are needed.

A powder for which startling claims are made is the Victor, which, grain for grain, is said to have from four to twenty-four times the illuminating power of other powders. If these claims can be substantiated in practice, Victor should be found of great advantage in flashlight work. Agfa Blitzlicht is a powder of the non-explosive and smokeless variety, with a noiseless flash, and great rapidity of combustion. I note that it has been subjected to experimental test by the well-known authority, Dr. Miethe, who certifies to its properties.

For single portraits, four grains; small groups, fifteen grains; groups of five or six persons, thirty to forty-five grains, and large groups sixty to ninety grains are advised. With a portrait lens for a head-and-shoulder cabinet, one-third teaspoonful of Nichols' Portrait powder is sufficient, a screen being employed. For a group with the lens at *f*/8 and the lamp unscreened, a quarter box of the same powder is sufficient. In using Nichols' lamp and powder for a home portraiture, the lamp should be operated as near as possible to the subject. The amount of powder advised for conventional lightings varies from one-quarter to one and one-half teaspoonfuls, reflectors being used to diffuse the light and the lens being shaded. It is impossible to be definite in dealing with quantities of powder for use in flashlight work, the variation of any one of the factors mentioned exerting a corresponding influence in the calculations, but the foregoing data will be found safe guides in practical work.

Oxy-magnesium

A little known application of magnesium to flashlight purposes is its association with compressed oxygen. A powerful light can be obtained with the blow-through lamp by using oxygen instead of atmospheric air for blowing the magnesium into the flame. By those who use the lantern and have a cylinder of oxygen on hand, this can be managed by removing the rubber ball from the flash-lamp and making a connection with rubber tubing between the magnesium chamber of the lamp and the nozzle of the cylinder (or regulator). A chemist's spring clip should be used to pinch the tubing half-way, or it may be divided in the middle and joined up again on a small double-ended stop-cock.

Magnesium Powder

In the use of pure magnesium powder it is important to remember that the quantities specified *must be burned*, with an ample supply of air, not half-consumed or wasted. The following table, given by J. H. Crabtree in the *Photographic Monthly* (March, 1906), may be taken as a reliable guide, being based on practical experience. The conditions suppose a lens at *f*/11 and a fairly rapid plate:

Distance of main object	Relative size of room			Grains of Magnesium required
	Length	Breadth	Height	
Feet	Feet	Feet	Feet	
9	15	6	10	15
15	20	6	10	30
20	25	10	10	75
25	30	12	10	120
30	35	12	10	180
35	40	15	10	230
40	45	15	12	300
45	50	20	12	370
50	60	20	12	460
55	65	20	12	560
60	70	30	15	680
65	75	30	15	780
70	85	30	15	900
75	90	40	15	1,020
80	95	40	15	1,200
85	100	45	20	1,340
90	120	45	20	1,500
95	125	50	20	1,650
100	130	60	20	1,850

It is in order, in closing this section, to emphasize the warning: *Never use a compound flash-powder in a closed, storage, reservoir or magazine lamp*—use plain magnesium only.

Study Your Sitter

Trite advice, no doubt, as you should study every subject, no matter what it it is: but it is peculiarly applicable in in the present case. In portraiture pure and simple, make a preliminary study of the head by the ordinary light of the room, if possible, before the exposure is made. Have at hand a properly-lighted daylight portrait and then, by getting your sitter to alter the position of his head so that the lights and shadows upon it will appear in the flashlight picture in the same relative values as they are shown in the daylight photograph, you will get a daylight pose and effect, or a great deal toward it. See that the shadow cast by the nose does not reach below the middle of the upper lip, and that

the shadow also cast by the nose on the cheek is not too broad. So with the high lights. The face should be full of half-tone, blending into the high lights on the one hand and the shadow on the other. If you have made this experiment by the ordinary light of the room or studio, when you come to expose you will be in a way to get a well-rounded, properly-lighted effect without deep shadows or harsh patches of white upon it.

The Eyes in Portraiture

I assume through this monograph that some standard work on lighting is at hand—the book by Mr. James Inglis, for example,—and that you know how to correctly pose and light your sitter or group. But the assumption may be erroneous. Very well. Get the book and study it. Take a special hint, however, as to the eyes of your victims. Whenever possible prevent them from looking straight at the camera or the source of light: so that the startled expression, so common in these photographs, is obviated. Let the heads be so inclined that they are looking away from the business end of the room. The next best thing to this expedient is to interpose between the light and the figure or group a screen or diffuser made of translucent paper or similar material. This you can have stretched on a light wooden frame and held or supported at such a point that the flash is made directly behind it. This will prevent the rays of light from striking into the eyes of the sitter. In large groups, in halls, theaters, public buildings, etc., this hint may be disregarded. Here your camera and source of light are many feet or yards away from the nearest individual and the confident operator may go about his work quite indifferent to such matters. Sometimes the eyes of the sitter are closed in the photograph: this is due to the fact that the exposure was made in darkness and the sitter startled. The ordinary illumination of the room may be turned down during flashlight work.

Closing of the Sitter's Eyes

In a recently published monograph on magnesium-light photography M. Albert Londe, a well-known French authority alludes to the well-known fact that many flashlight portraits show unnatural effects about the eyes. In many cases they appear half-closed, in some com-

pletely closed, and in others abnormally large, the last case being of course due to the absence of other lights in the room. The following table by M. Londe proves how short a flash should be not to show partial or complete closing of the eyes :—

	Commencement of closing	Finish of closing
A powder	0.08	0.12
B powder	0.09	0.12
C powder	0.08	0.12
D powder	0.09	0.11
E powder	0.09	0.11
F powder	0.08	0.10
G powder	0.08	0.11

These results were obtained by the aid of the author's chronophotographic camera, which practically consists of twelve lenses in three rows of four each, electrically opened for $\frac{1}{200}$ of a second, with an interval of $\frac{1}{100}$ of a second between each exposure. The ultimate result is that any powder that burns longer than about $\frac{1}{12}$ of a second will not give a natural apearance to the eyes. The powders used were commercial preparations, the exact nature of which was unknown.

Flashlight versus Daylight

We must dismiss a common fallacy from our minds, namely, that flashlight photographs are necessarily distinguishable from those taken by daylight. This is not the case. If, however, the artificially illuminated photograph shows by critical examination of its lights and shadows that it is lacking the softness and harmony of a good daylight picture, the operator and not the system has been at fault. We should be unable to tell one kind of photograph from the other. The photographer, at the outset of his work, must make up his mind that his finished result,—whether it be a portrait, a group, an interior or a special subject,—shall not betray the nature of the light that was used to make it. Magnesium is practically a perfect substitute for daylight, provided it be handled with intelligence and the conditions that dictate its use are carefully studied.

Auxiliary Lighting

Be sure to keep both yourself and your light out of the picture. You are handling light, as it were, in a liquid form and, without sacrificing roundness or modeling,

your object is to direct that stream of light on to your subject so that it is evenly illuminated without the juxtaposition of heavy shadows. Another thing to consider is that daylight or gaslight are useful auxiliaries in flashlight work. If the photographs are made in the evening, and the hall or room is lighted by electricity, so much the better, You can focus by it and its admixture with the flash will help to soften the results. The same reasoning applies to daylight whether in the studio or elsewhere. The combination of natural and artificial light, so far from being mutually antagonistic, is in every respect advantageous. Another feature of combined, lighting is that the exposure is proportionately shortened. Scientifically, too, combined lighting is to be commended as the entire range of spectrum rays is used when daylight supplies the illumination. For, spectrally, all artificial illuminants are more or less defective and so they fail as ideal substitutes for daylight, although in practice their spectral incompleteness may be neglected.

Interiors

No factor in interior photography deserves more serious consideration than the dominant color of the subject, wholly or in part. It is here that the old advice of exposing for the shadows and letting the high lights take care of themselves applies with some force. There are no distinct high lights in the true sense of the term, the range of tone from light wall-paper, curtains, hangings, down to heavy shadows of a dark interior or mahogany-colored furniture being, after all, comparatively narrow. I presuppose that direct sunlight is absent. There may be windows in the hall or room, and the light they pass, if it be daytime, will be of great service, as I have already pointed out. The point to aim at is that the light must be well diffused and such a lamp used as will admit of the burning of a comparatively large quantity of magnesium. Many subjects require a large and brilliant flame to secure an adequate exposure. Obviously the quantity of powder to be used depends upon the size of the interior and other factors, such as lens aperture, rapidity of plate, etc. Here is a rough idea of various quantities which should guide the operator in interior work embracing small halls, shops, stores or the like:

10-foot	distance	light	subject	1	teaspoonful
10-	"	dark	"	1½	teaspoonfuls
15-	"	light	"	2	"
15-	"	dark	"	2½	"
20-	"	light	"	3	"
20-	"	dark	"	3½	"
25-	"	light	"	4	"
25-	"	dark	"	5	"

Flashlight Candles in the Ball-room

In the winter time, soirées, balls and dinners are much in evidence, and some good opportunities occur for getting excellent effects. I give the details of some of my own experiments in this work. The room is a dining saloon accommodating about sixty persons; cleared for a dance, the same room would hold about eight or ten sets. The apparatus consisted of a whole-plate camera fitted with a whole-plate rapid rectilinear lens of eleven inches focus (the angle thus being rather narrow), stopped down to *f*/11. The plate was sharply covered, but practically one-half only of the room could be taken, the illumination proceeding from two seven-second-flash arc candles, sold by Fuerst Brothers and ignited simultaneously. The plate was found to be fully exposed, and the result was satisfactory. In order to take in a little more of the room, the same lens, at the next attempt, was used on a 8 x 10 plate, which was covered extremely well. Here the angle is wider, the effect better, and for this group the exposure was three of the candles. The working data were: An 8 x 10 Imperial special rapid plate; 6½ x 8½ R. R. lens, working at *f*/11.; exposure, three seven-second-flash arc candles; developer, Imperial standard.

Details of the Room

The better to guide the reader, I will generalize on certain details, shape and size of the room. The operator should have a clear idea as to how much and how little of the room and space he can get on his plate. Therefore, it is unwise to leave everything to be fixed up at the time of operating. It will save trouble and loss of time to set up the camera and make a visual trial of the place in daylight, noting the standpoint of the camera. By placing a temporary assistant here and there we discover

how much we shall certainly get on the plate, and, consequently, where the grouping must be done. For the proper position of the illuminant, one must be largely dependent on circumstances. A small shelf or bracket may have to be put up temporarily on which to place the candles — or other light source — and these should be ignited on a metal surface. A good plan is to have a large sheet of tin and bend this in such a way—"L" shape—so as to make a reflector as well as a safe surface on which to burn the light. It is not safe to leave these matters until the last moment. With regard to lighting, the candles should be above and behind the camera and to the right or left. If, by chance, the light must be somewhat to the front, the lens must be carefully shielded: indeed, in all cases, the more carefully this little detail is attended to the better will be the results. A projecting hood to a lens is never a disadvantage, and in flashlight work is a *sine qua non*. One has only to look through the length and breadth of a room when some function of the kind is in progress, first with the naked eye and again with a paper cylinder intervening, to note the difference in the penetrating power, as I may term it, of the eye in one case, and when looking through the cylinder or tube. In short: use the lens under similar conditions and the result is seen in the clear and distinct delineation of the subjects.

Subterranean Work on a Large Scale

When a subway or tunnel is in progress, one of the first things usually required by the contractors is a photographic record of the work in its various stages. In making exposures of the kind, the photographer, if new to the undertaking, must be guided to a considerable extent by the experiences of others. His first difficulty is of course to decide upon the quantity of powder to use, and the methods of its distribution and ignition. Not long since the head of a large street railway corporation made exposures with lamps that held a pound of pure magnesium. Considering the fact, adds Mr. H. S. Hood, to whom I am indebted for this information, that a magnesium wire $\frac{1}{100}$ of an inch in thickness will give a light approximating 75 candle-power, it will be seen that one pound will give an enor-

mous volume of light. Nevertheless, this quantity of powder was found to be inadequate when blown through a lamp by means of a large bellows and hose. In addition to this it was possible to take only two or three photographs before the lamp was unfit for use, as the brass of which it was made was unable to bear the immense heat caused by the magnesium. Three or four lamps were designed by the photographer, and after being used several times, were overtaken by the same fate. The work in hand was that of photographing a tunnel three quarters of a mile in length.

How It Was Done

Finally, he evolved a mixture that was about half way between a powder of the Luxo type and pure magnesium. It burned fairly rapidly, making a dazzling flame of tremendous power that projected a path of actinic light to a great distance. It was easy to ignite, nothing being required for the purpose but a piece of newspaper and a match, thus dispensing with a lamp. When the camera was in readiness to take the picture, with the plateholder in and the slide removed, a line of powder was dropped from one side of the tunnel to the other, at a distance of about ten feet from, and behind, the camera. A fuse was improvised from an old newspaper, and when the lens was uncapped, the paper fuse was ignited. When the flame reached the powder, which took only a few seconds, it burned with a slight hissing noise, giving off a flood of light that traveled approximately three hundred yards. The flash lasted from three to five seconds and gave off great heat. The flame was about twenty feet high and five feet wide. Any of the fast-burning powders on the market can be used, concludes Mr. Hood.

Stage Groups by Flashlight

Stage groups in theaters or large halls are two kinds of work that are practically identical. My own experience in this kind of negative-making is confirmed by that of Mr. C. F. W. Sage, a skilful English photographer, who published in "Photography" some notes on the use of the Bayer powder for the work. He had to take a group of a theater and fired one and a half ounces of powder. He used an Imperial extra-rapid plate and a Ross

Rapid Symmetrical lens working at $f/8$. The negative was fully exposed. As to the position of the light, Mr. Sage points out that the great secret lies in having it sufficiently high up. To exemplify this he supplies a rough plan of the hall in which the photograph was taken. The camera was in the center of the hall, the flashlight system was placed on the top of a pair of stairs twenty-five feet high, about six feet to the right of the camera and about six feet behind it. Behind the steps he had a lantern screen suspended from the roof to act as a reflector. One and a half ounces of the Bayer flash powder was placed in a heap on the tin and in the middle of the heap was stuck about one and one-half inches of wax taper with the ends frayed out. He then asked those in the group not to look toward the steps, as the flash would be very brilliant and would probably make them appear with closed eyes. Having lighted the taper he removed the cap and waited for the flash. The causes of so many failures in photographing a large group he summarizes as, (1) inferior powder; (2) the light not being sufficiently high up, and (3) dividing the light. This last he thinks is a mistake. It is better to have one powerful flash of light.

Magnesium Ribbon

A favorite lamp at one time was the "Minasini." I used it for group and interior work, as well as for slow lantern-slide and transparency-making. In this lamp the coil of ribbon was paid out by simple clockwork arrangement, the little machine being held in the hand. The time of exposure was governed by the quantity of ribbon set free from the reel. Such a lamp is, of course, not suitable for large subjects. Ribbon lamps are of comparatively great antiquity—but the system has not survived to any extent. The ribbon itself is quite adaptable for photography at night as it dispenses with the use of special apparatus, and for occasional work is extremely convenient. Portraits and small interiors are the subjects most suitable for treatment. The ribbon should be kept in motion while it is burning, as by that means the sharp outlines of the shadows are softened down, a diffuser being placed behind the ribbon, and the light being prevented from striking behind the lens of the

camera. As with magnesium, the ribbon should be burnt from a position at one side of the camera and behind it. With a time exposure you can burn the ribbon in two portions, one on each side of the camera. As a rough guide to the quantity of ribbon to use: with a domestic interior, having light-colored walls, 6 to 8 feet, would suffice, assuming the aperture of the lens to be $f/8$, and extra-rapid plates in use. The distance of the nearest object I assume to be about 14 feet from the light. At half that distance, 4 feet of ribbon would suffice. As a supplementary illuminant in daylight exposures, the ribbon also has its uses: in dark corners, on heavy old furniture and the like, the light from a few feet of ribbon is of assistance.

The Group Suppose we are taking one of those small domestic groups that form so large a percentage of the flashlight workers' efforts in the early stages of his career. It is night and the gas or the electric light is on. First pose your figure or group, arrange your reflector and background, if you are using them, and be sure to give a thought to the deep shadow parts of your picture: and lighten them up. Try to make your sitters indifferent to your presence and that of your camera. If you succeed in this you will be fortunate and will make for a result that will have spontaneity of effect written across it. Now focus the picture. If there is no great glare of light and you are using a focusing-screen, a page of printing in large type held in the hand of one of your sitters will assist you in getting a sharp image on your screen. If you are using a focusing hand camera without a ground glass, then use your scale. Now close your shutter or cap your lens and make ready with your lamp, your flash-paper or candle. Choose a position two or three feet behind your camera and have your light by your side. Withdraw the shutter of your plate-holder, uncap your lens and open shutter. Then fire your lamp, paper, bag, or candle as the case may be. After an exposure open a near window so that the smoke may subside with all possible rapidity. This simple method of procedure is expansible in many directions. With dogs, cats or small children it is advisable to make all

your preparations beforehand and trust to the inspiration of the moment for a successful pose and exposure, focusing the chair or seat first of all. The animals soon tire of seeing you handling your camera: whereas, when all is previously ready, their air of natural alertness is the more likely to outlast the small preparations then necessary. See that the light does not impinge on the lens and that smoke from a previous flash is not present in the room, otherwise foggy plates will result. Flatness may be avoided by mitigating too much front lighting and insuring that the flash is made from a point not too low down. For small groups of the kind referred to in this section Eastman's No. 3 Flash cartridges will be found convenient.

For 7 feet distance and light walls and hangings use 1 No. 3 Cartridge.
For 7 feet distance and dark walls and hangings use 2 No. 3 Cartridges.
For 10 feet distance and light walls and hangings use 2 No. 3 Cartridges.
For 10 feet distance and dark walls and hangings use 4 No. 3 Cartridges.

Candle-Light Effect

In candle-light work Mr. Newton Gibson, who has been very successful, recommends the use of a stand camera with a focusing screen. Models and accessories being on one plane permits of the employment of a portrait lens with large aperture: but any lens working at *f*/8 or *f*/11 will do. To make the lamp, procure a piece of wood 2 feet 6 inches long, 1 3/4 inches wide, and 1/2-inch thick, with one end rounded and beveled off on one side to 1 inch in width. Having a piece of thin tin, 15 inches long and 3 inches broad, bend this down the center V-shaped, make a few holes 1/4-inch from the edge, then tack this on to the beveled edge of the wood 1 1/4 inches from the bottom. Obtaining another piece of tin 1 1/4 inches, make a slit in the center to make the magnesium ribbon, edgewise on, a little deeper than the breadth of the ribbon, double this over 1/4-inch, make three holes and tack close up to the chimney, bore 1/4-inch hole at the other end of the wood 1 inch from the top. Black the chimney and the edge of wood with

dead-black varnish, then cover the other side with black velvet. With another piece of wood, 3 feet long, with a ¼-inch hole in one end, and the edges chamfered off to hold by when in use, bolt to hang loose on the velvet side of the other piece. As soon as the magnesium ribbon begins to burn, open the lens, raise the lamp so that by the time the ribbon is burnt the lamp will be just over the candle flame, then close the lens. With this lamp during the evening in any ordinary room having an incandescent light a little above the camera to focus by, many striking effects can be made, pointing the lens toward some dark corner or open doorway a few feet distant, which acts as a substitute for the black velvet. A typical room for this purpose should be about 15 feet long by 7 feet wide, with a window 3 feet 6 inches by 2 feet 6 inches, with roller blind of white linen and a darker one to keep out bright sunshine. After making all preparations such as backgrounds, model, etc., regulate the blind until the candle gives a shadow round the candle-stick and the exposure is to be made which will require an assistant to manage the lamp or uncap the lens as soon as the ribbon begins to burn. In development, adds Mr. Gibson, the aim must be towards delicacy, high lights and just a little detail in the shadows. As soon as the outline of the lamp begins to show to proceed further would make the negative too dense. Too much daylight gives a flat print; too little too much contrast. The candle must be about the same distance from the lens as the model. Many fail in having the lamp too high; have the light lower than the head of the model.

Firelight Effects

These effects have of late become very popular. They are produced in a simple manner. The subject having been posed and focused, a long and steady flash without smoke must be given. Proceed by taking flash paper (the Eastman flash sheets answer the purpose) in half-inch strips, and attach them to a board about 10 x 18 inches, an inch or so separating the strips. Arrange the strips in zig-zag rows, so that they overlap at each end. The board being placed diagonally in one corner of the fireplace, the lower corner, when

ignited, will make a steady white sheet of flame lasting several seconds, the smoke passing up the chimney. The paper should be ignited by means of a light attached to a long strip; this operation being performed so that your active hand does not appear in the picture.

Mirrors and Their Uses If there are any mirrors or reflecting surfaces in the field of view, see that you do not photograph yourself, your camera, your light, or anything that is yours in them. Gas globes, or electric-light bulbs should be kept out of the picture, if you are not using backed plates, or you may get halation. That has been my experience; although, on the other hand, with very quick exposures and thickly coated plates or films I have made negatives in which halation has not appeared. But about mirrors: They have their uses in photography as well as their drawbacks. In other words, you can photograph the reflected image or figure or group. Very often it is a convenience to be able to do so. The use of a mirror for this purpose is not a new idea,—very few things in modern photography really are. To proceed: The sitter or groups should be placed obliquely to the reflecting surface, the camera, also, having its position in a like situation on the other side of the room. Roughly, the system forms a kind of triangle, with the mirror as the apex. The light should come from a point behind both sitter and camera. In an ordinary room, a lens of comparatively long focus can be used and distortion of the image thus obviated. You will reverse your lefts and rights by this method, but this need not matter very much if your sitters are not actively using their hands and printed matter is not in the picture. Take care that the light is well behind the camera and that the mirror is clean.

Flowers by Flashlight The photography of flowers by flashlight is a department to which prominence has been given by Mr. J. H. Crabtree, F. R. P. S. He uses a short-focus lens, preferably an anastigmat, so as to give as flat a field as possible. A special base-board for vertical work, which can be adapted at any angle from 50° to 90°, a right angle of wood, which can also be used as a flower-stand

a few narrow vases, various backgrounds of different shades (large sheets of Nature mounting, attached to a drawing-board), and flashlight powder specially prepared, viz., Bayer's panchromatic time-light powder. Powder-stands are also required, either one to be adjusted at different altitudes, or one three feet, and another about six feet high. Extra rapid orthochromatic and backed plates (about 200 H. & D.) must be used. Briefly: the method is to photograph the flowers vertically: that is, the lens is pointed directly over them, or the flowers may be placed on slanting backgrounds. The powder is fired by means of a cane walking-stick holding a lighted taper. The flowers having been arranged, two flash exposures are given, one to the right of the camera, the other to the left, unequal quantities of powder being used, so as to avoid flatness. Mr. Crabtree's articles appear in "The Photographic Monthly" for March and April, 1907, and should be consulted direct by the reader who desires fuller details of the method. The stern system of compression and condensation followed in the preparation of THE PHOTO-MINIATURE obliges me to deal with Mr. Crabtree's work, and that of many other gifted specialists, in the briefest possible manner.

Christmas Trees

Even such a homely subject as the Christmas tree yields a capital opportunity for flashlight treatment. To proceed: Place the tree in the center of the room and light the candles upon it. Use all the ordinary light of the room and focus the candles. A small stop, say *f* 16, should be used. At the aperture named, and on an extra-rapid plate, the exposure requires about 60 grains of powder. Some workers recommend a time exposure. I have taken photographs of Christmas trees under the conditions specified with complete success. Grouped around the trees have been children and adults: the resulting prints are of lasting interest.

Animals

The faithful dog and the harmless necessary cat must not be overlooked. Good photographs of such subjects have a most engaging spontaneity and alertness of expression. Have everything in readiness before the pet is enticed

into position on the image plane. If the sitter has been accurately focused, then a mass of very fine detail will show in the negative. A moderately large stop should be used, as depth of definition is not sought after, especially in single portraits. On the other hand, when the animal forms one of the family group, the job is usually easier, as the attention of the canine or feline sitter is not wholly fixed upon what is taking place at the active side of the camera.

A Flashlight Developer

The developer I have long used and still recommend is as follows: No. 1. Hydroquinone, 1 ounce; eikonogen, 1 ounce; sodium sulphite, 5 ounces; boiling water, 90 ounces. No. 2. Carbonate of soda, 5 ounces; boiling water, 30 ounces. Dissolve the sulphite in boiling water; add the eikonogen, and lastly the hydroquinone; then dissolve the sodium carbonate in boiling water. These solutions keep well and give good, plucky negatives, suitable for platinotype printing.

An Electric Flash Lamp

Although not strictly part of our present subject, the taking of photographs by the ignition of special compounds, flashlight photography by instantaneous electric exposures in an obvious development of it. The introduction of a special lamp for the purpose, the Jupiter, therefore deserves reference here. This lamp will photograph large groups with an exposure of only a fraction of a second, yet the glare is not disconcerting, because it is interjected into a light that is brilliant already. To describe it briefly, the lamp consists of a reflector, containing eight 32-candle incandescent lamps, with a double arc placed in their center, behind an ornamental-looking diffuser of crinkled glass. The incandescents are used for posing and focusing the arcs for the exposure. The lamp-head has universal motions, and is supported on a stand which can be wheeled about the studio. Posing and focusing by the light of the incandescent lamps is easy, and the double arc, giving very powerful actinic light, can be switched instantaneously, or maintained for an indefinite period. As well-lighted and fully exposed full lengths, and groups of three or four, can be made with $\frac{1}{10}$ of a second, there is seldom

need for the prolonged light. The outfit can be adapted to continuous, alternating, or three-phase current; and it costs, complete, with resistance, switchboard, about two hundred dollars.

Conclusion In drawing the present number of THE PHOTO-MINIATURE to a conclusion I have only to add that the aim throughout has been to supplement the previous monograph on the subject, and to stimulate interest in a branch of work which is growing in favor with all classes of photographers. At the same time I have endeavored to avoid repeating information already published.

BOOK

The only other work at present available on the subject is *Magnesium Light Photography*, by F. J. Mortimer, F. R. P. S. 1906, 88 pp., 50 cents.

Notes and Comment

*** THE PHOTO-MINIATURE for February (No. 86) will treat of "Carbon Printing," and describe the most modern developments of the process. The "News and Comments" will form a strong feature of the number.—[EDS. P.-M.]

In honor of Mons. Antoine Lumière founder of the house of A. Lumière, and ses Fils, Lyons, France, the inventors of the autochrome plate, a dinner was held at the Hotel Majestic, Philadelphia, on Tuesday evening, December 17, under the auspices of the editors of "The Camera" and "Bulletin of Photography." Besides the guests of honor, there were present Mons. Edouard Lumière, Mr. F. G. Brulatour (manager of the New York branch of the Lumière house); Pirie MacDonald and A. F. Bradley (New York); T. Dixon Tennant (Wilson's Magazine); Prof. A. W. Goodspeed, of the University of Philadelphia; C. H. Claudy; Louis E. Levy, and many other gentlemen prominent in Philadelphia photographic and scientific circles.

Owing to the expense of its production the Society of German Engineers has resolved to discontinue the *Technolexicon*, an ambitious work of an encyclopedic nature, in which photography would have had a prominent share.

Messrs. Folmer and Schwing ask us to announce that they have prepared a series of lantern slides which they intend loaning to camera clubs, photographic societies, schools and other organizations interested in photog-

raphy. These slides are placed at the disposal of clubs desiring the use of them. They are obtainable on application to the Folmer and Schwing Division, Eastman Kodak Company, Rochester, N. Y.

The collection of German photographs which has been sent to America by Herr R. Duhrkoop, of Hamburg, was recently on view at the Drexel Institute, Philadelphia, and attracted much attention, the newspapers devoting many laudatory articles to the exhibit.

An International Photographic Exhibition will be held the month of April, 1908, at Riga, particulars and entry forms for which can be obtained from Mons. O. K. Soldstner, Suoworowstrasse 14, Riga, Russia. There will be five classes for pictorial and other branches of photography, and, besides a grand prix, gold, silver and bronze medals and diplomas are offered in competition. Intending exhibitors should apply at once for entry forms.

Hauff on Modern Developers (80 pp., price 25 cents), published by G. Gennert, New York and Chicago, has reached us. This little book treats in detail of the well-known Hauff development products; and, besides including a very large number of tested formulæ, submits many chapters of instruction in exposure and the general treatment of dry plates. We can cordially recommend the book to our readers, who will find in it much that is useful to know in their work.

One of the features of American photographic activity during last December was the exhibition of the Photo Secession at the Little Galleries, 291 Fifth avenue, New York, which was held under the directorship and guidance of Mr. Alfred Stieglitz, one of the most renowned pictorial workers of our time. In all, the exhibits numbered ninety-five, the productions of, amongst others,

Coburn, Steichen, Stieglitz, Mrs. Kasebier, Clarence White, Mrs. Jeanne Bennett, and others. A highly attractive addition to the main exhibition was the presence of twenty-four autochromes produced by Eugene, Steichen, Stieglitz, and White. The exhibition drew crowds of visitors, and the members of the Photo Secession are to be congratulated on its undoubted success in stimulating public interest in pictorial photography. We note with pleasure that the "New York Times," of a recent date, devoted a whole page to reproductions of Secession photographs, and that it contained a highly appreciative and discriminating critique of the exhibition.

The Ansco Company, of Binghamton, N.Y., announce the issue of Professional Cyko cards of semi-matt surface in boxes of 500 and 1,000 cards only. The card-board is the same as that used for the regular Cyko card, viz., pure linen stock of standard weight.

Direct paper positives in the camera are the latest resource placed at the disposal of the progressive photographer. The system is due to the labors of the Pifer Positype Company, of 10529 St. Clair Avenue, Cleveland, Ohio, who have sent us for practical trial some of the material, upon which we will report in an early number of THE PHOTO-MINIATURE. The paper is called Bromotype, it is exposed in the camera just as negative plate or film would be, and upon treatment with special solutions, called Blanchite, Sepiatone or Nigratone, gives, according to the specimen before us, what seems to be a warm-toned bromide print. The exposure required is rather more than that given a very rapid plate. Upon development a negative image (we quote from the instructions) is obtained. Then it is bleached in Blanchite, cleared, toned, and finally washed and dried. The Pifer Company hint that they have in preparation a paper roll adaptable to film cameras. The production of direct paper positives in the camera is an admirable idea, which should commend itself to many.

The Photographic Convention of the United Kingdom, which meets next July at Brussels, has secured one of the Belgium Royal Princes as President d' Honneur. The actual President is Sir Edward Hertslet, who occupies a distinguished position in the British Consular Service and is a gifted amateur photographer. The Conventioners, as is customary with our British brethren, appear to be assured of an enjoyable holiday in Belgiura, and we wish them a happy experience in their first European excursion. And now, Gentlemen of the Convention, when are you coming to America? A warm welcome awaits you here.

Our contemporary, "The Moving Picture World," published at No. 361 Broadway, New York, now in its twelfth month of weekly issue, has taken to inserting illustratiens of men prominently identified with the motion-picture world. Under the editorship of Mr. Alfred H. Saunders, "The Moving Picture World" is evidently firmly established in public favor.

The late Mr. A. L. Henderson, ["Sandy," as he was affectionately dubbed] who was personally known to photographers in parts of the States—and indeed of the world — left his valuable books to the Guildhall library of the corporation of the City of London.

The death of Lord Kelvin, the eminent Professor of Natural Philosophy in the University of Glasgow and one of the foremost men of science of the time, occurred recently. One of his latest public appearances in Britain was at the Jubilee dinner of the Royal Photographic Society, on which evening he took occasion to eulogize the services which photography has rendered to science.

Herr Paul von Toanovich, of Budapest, claims to be able to develop twelve under, over, or correctly exposed

plates in one minute. Two ordinary stand-development or grooved troughs are used. In one he places sufficient of the following: Sodium sulphite, 960 grains; metol, 48 grains; hydroquinone, 48 grains; water to 20 ounces. The other is filled with potassium carbonate, 960 grains; water to 20 ounces. The plates are placed in a metal rack, immersed in the No. 1 tank and moved up and down for thirty seconds, then taken out and immersed in tank No. 2 for a similar period, after which they are washed and fixed. The advantages claimed for the process is that it is quick; and that, being purely mechanical, faultless negatives are obtained—the effects of over-exposure cannot be seen; the plates do not fog and are never under-developed. The process is applicable to roll or cut films, time or instantaneous exposures, lantern-slide work with short exposures. Every kind of developer in which an alkali appears may be used.

The use of specially devised electric lamps by photographers for studio work and printing is rapidly becoming universal. The photographer who installs a good lamp of this kind, or a combination of lamps, is practically independent of daylight—an important advantage at this season when the dull days interfere with sittings in portraiture and the getting out of prints for orders. A thoroughly reliable and economical electric lamp for this purpose is introduced by H. D. Farquhar, New York. The Farquhar lamp is being successfully used by such eminent portraitists as Pirie McDonald and E. B. Core, New York, which speaks well for its practical efficiency. A descriptive leaflet can be had on application to the manufacturer, 103 Chambers Street, New York.

Autochrome plates for scientific purposes supplies Mr. F. Martin Duncan with a theme for the following short article in the last Color Supplement of "The British Journal of Photography." As the first to apply the Autochrome plates to scientific work, some of my experiences with them may be of interest, and a

slight help to others. In the early batches of plates that arrived there appeared to be some appreciable variation in speed, which proved rather disconcerting in determining the correct exposure. But this apparent difference in speed, I am now of opinion, is really produced by delicate variations in the color of the daylight, frequently very difficult to appreciate optically. If some simple form of meter could be placed on the market, which would register these variations, it would be a great help in the determination of the correct exposure. The whole perfection of the result depends, of course, upon approximately correct exposure, and I have found that it is safer to err on the side of over—rather than under exposure,—the Autochrome plate having considerable latitude as regards over-exposure, but not for under-exposure. As regards the density of the image, it is certainly advisable never to omit the intensification; and a weak image can be built up, and the plate saved in many cases, by re-intensification. Should the image appear too strong on taking the plate from the final fixing bath, or the subject look dull and heavy, I have found that a very weak solution of Farmer reducer will work wonders in giving pluck and brilliance; but it must be used with great caution, and the plate removed and instantly washed under the tap, to stop the action of the reducer before it has gone too far. I have had comparatively little trouble from frilling, having generally taken the precaution to dip the edges of the plate in melted paraffin wax before commencing development. It is important, by the way, to remove every trace of the wax before attempting to varnish the plate, or trouble from streaks of partially dissolved wax flowing across the plate will arise. Provided the plate is carefully washed between the first development and solution C, the temperature of the solutions and washing water kept to the same degree, and the plate handled as little as possible, waxing is generally an unnecessary performance. It is very important to most thoroughly clean the glass surface of the plate before placing it in the dark-slide, otherwise markings will appear which are undoubtedly caused by particles of emulsion, etc., that adhere to the glass side of the plate. As regards expos-

ures in the field, they have varied from four seconds, using a lens working at $f/4$, to 12 or 14 minutes according to the lighting of the subject, time of day, etc., and I have obtained a number of most interesting records in color of various creatures and plants in their natural environment. In the laboratory I have found the Autochrome plate a most valuable addition for photo-micrographic work, exposures ranging from two minutes to half an hour, according to magnification and subject.

Of the International Photographic Exhibition to be held at Dresden in the year 1909 we have received the advance prospectus, and, as it is printed in English, we are enabled so set forth comparatively full details for the information of intending exhibitors. To begin with, the area of the buildings in which the exhibits will be shown exceeds one and a half acres, the area of the grounds being over 16 acres. The exhibition will be under the patronage of the King of Saxony, and Prince John George, Duke of Saxony, is to be President of the Honorary Committee, the names of which include those of many prominent merchants, officials, photographers, and representatives of the bureaucracy. There will be awards in the classes, and trophies for extra conspicuous merit, important improvements and discoveries in photography, as well as diplomas, gold and silver medals and plaques for other exhibits. The international character of the exhibition manifests itself in the declared intention of the promoters to make it a collective representation of photography in all its branches and in all civilized countries, the endeavor being to show the evolution of photography and its achievements in Art, Science and Commerce. To this end a very wide and comprehensive classification has been adopted and from which it appears to us that every possible application of photography has been scheduled. An International Exhibition carried out on these lines should be a wonderful and instructive display. The complete prospectus is obtainable from the offices of the Exhibition, Neumarkt 1 (Hotel Stadt, Berlin) Dresden-Alstadt, Saxony, and we advise our readers to write for a copy of it.

Sixteen hundred dollars in cash prizes are offered in the 1908 Kodak Advertising Contest, one thousand being allotted to the professional class and six hundred to the amateur. From the circular relating to the contest which has been sent us by the Eastman Kodak Company, we gather that the first prize for one negative in the Professional class is to be $500. The circular states: "Pictures which are simply good photographs and contain nothing showing the use or the pleasures of the Kodak system of photography are of course valueless from an advertising standpoint. What we need are pictures that forcefully and pleasingly drive home the Kodak idea, and for these we are to pay liberally." The complete circular may be had on application to the company at Rochester, N. Y.

The Photo-Chemical Laboratory of the Royal College at Berlin speaks highly of a new lens—the Apochromat-orthostigmat—made by the firm of C. A. Steinheil, of Munich. The lens is adapted both for line work and also for half-tone reproduction. The finest results are had with a close-ruled screen and with very brief exposures so that excellent half-tone negatives may be made with it. The correction for color has been subjected to rigorous tests. For the three regions of the spectrum it gives equal images. The location for the secondary chromatic aberration was tested by the help of selection filters without any noticeable differences in foci. The instrument is excellent for color work and permits of three-color reproduction by the usual methods.

Books and Prints

All books noticed in these pages may be ordered from the publishers of THE PHOTO-MINIATURE and will be promptly forwarded postpaid to any address on receipt of the publishers' prices as here given.

The British Journal Photographic Almanac. 1908. Edited by George E. Brown F. I. C. 1,382 pp. Paper covers, 50 cents. Postage, 27 cents. Clothbound, $1. Postage, 35 cents. London: Henry Greenwood & Co. American Agents: George Murphy, Inc., New York.

The forty-seventh issue of this favorite annual differs in many vital respects from its immediate predecessors. Nearly three hundred pages of the book have been chopped off; the section devoted to contributed articles has been abandoned; and what with improvements in typography, rearrangement of indices, revision of tabular matter and other innovations, the old "B. J. A." comes to us quite rejuvenated and vigorous. The advantage of it all divides itself evenly between distributor and reader; the former can now handle a paper-bound copy without fear of its going to pieces; the latter has a big book, but not an overpoweringly unwieldy one. The frontispiece is a carbon print by The Autotype Company and the introductory article by the editor treats in some detail of the screen plate processes of color photography, chief prominence being given to the Autochrome process. In the Epitome of Progress, of some 140 pages, a survey is taken of the most recent advances in theory and practice. The revised formulae, occupying about one hundred and forty pages, bear the stamp of accuracy and authority and the editor has subjected the tabular matter to compression and revision. The Almanac, if it has become somewhat severely scientific in comparison with former issues, is nevertheless of undoubted practical value all

through and we cannot conceive of a progressive photographer who, in these days of rapid change and evolution, would willingly be without a copy.

Merck's 1907 Index. New York: Merck & Co., 15 University Place. 472 pp. This invaluable work is assured of a hearty reception at our hands, and we could wish for nothing better this moment than that it should find a place on the bookshelves of the serious student of photography. For, while being an enclycopedia for the chemist, pharmacist and physician, it also appeals in some measure directly to the photographer who desires to know the chemical derivation, nature and property of the substances he uses in his work. For example: suppose the amateur—or the professional—were suddenly asked to give some rough idea of what ortol is. In nine cases out of ten he would probably be "floored," as examination victims say. Well, Merck would tell him that ortol is methylortho-amidophenol, or that, according to Vogel, it is a combination of two molecules of methylortho-amidophenol and one molecule of hydroquinone. And so on, right throughout this dis-distinctly useful index.

Two catalogues of the celebrated house of Carl Zeiss, Jena, are to hand. One is of 24 pages and concisely summarizes the optical productions of the establishment. This is sent gratis to applicants. The second volume is a cloth-bound book and is obtainable for 15 cents from E. B. Meyrowitz, the American agent of Messrs. Zeiss. Therein we have ampler and more detailed references to the lenses and other specialties of the Jena Works, notably the Zeiss Special Teleobjective, optically ground light filters, etc. This larger catalogue is well worth having and the reader may be counselled to obtain a copy.

Willoughby's Photographic Bargain List No. 117, obtainable at 814 Broadway, New York, which has reached us,

contains particulars of many bargains in cameras, lenses, shutters, and other items of apparatus, both new and second hand. It should be in the hands of all our readers.

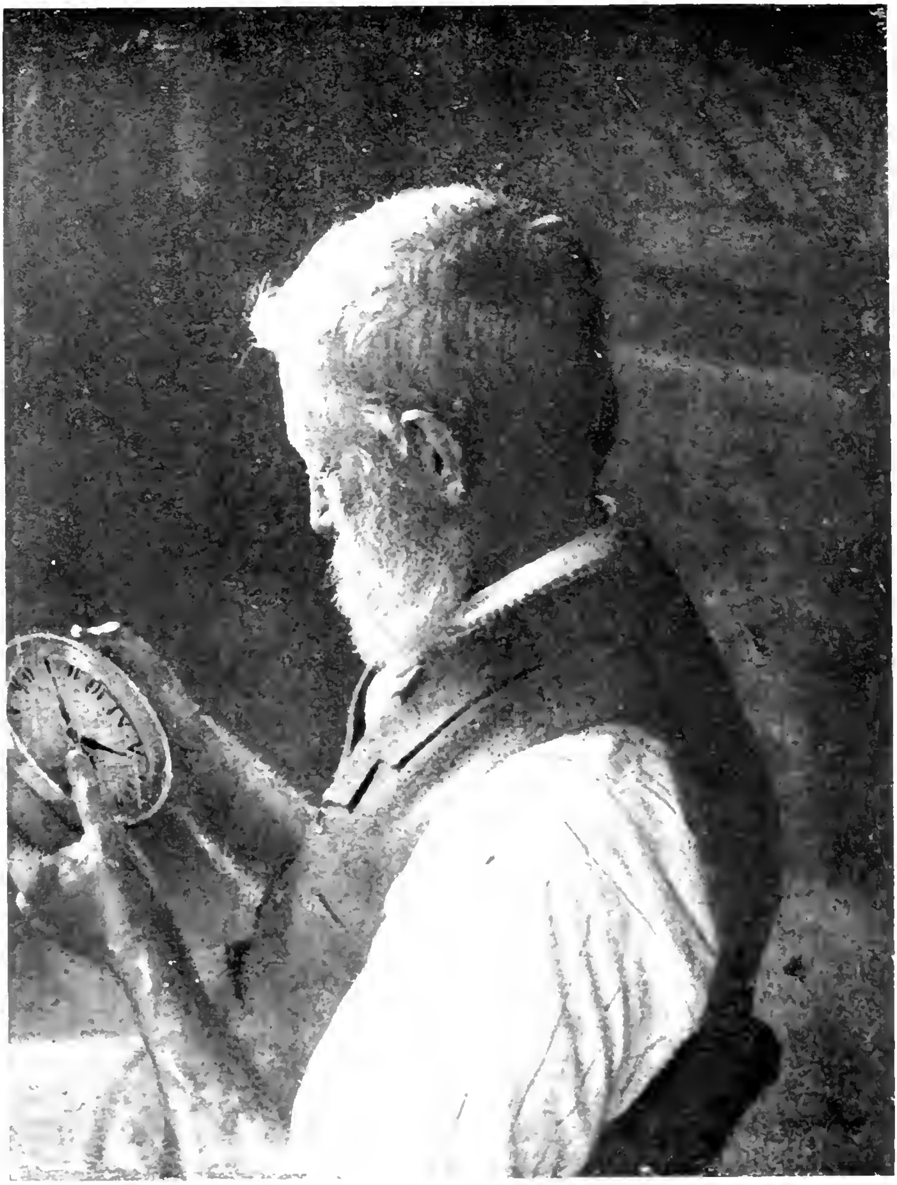
A group of cleverly written and printed catalogues has been sent to us by the Voigtlænder & Son Optical Company, of 137 West 23d Street, New York. The first item describes and prices the well-known Collinears, Heliars, Apochromats, Dynars, Telephotos and Euryscopes and gives many charming pictures made by the agency of the lenses. Then two minor booklets introduce us to one Taylor. This gentleman is supposed to talk—and he talks uncommonly well and lucidly—to the author of the booklets about the Voigtlænder lenses and their use. The booklets are an education in themselves, and we can cordially recommend them to all interested in the choice and use of lenses in photography.

The Eastman Kodak Company, of Rochester, N. Y., have issued an illustrated booklet entitled "Developing and Printing for the Amateur," designed to instruct and prompt those who conduct departments for the finishing of amateur work. What the company does in the book is to picture and describe how their amateur developing and printing departments are conducted, so that the photographer who caters for amateur requirements may profit by the information.

L. M. Kaiser

W. H. Wallace

A Pose by Hill, New York



The Clock-mender
(Author unknown)

The Photo-Miniature
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Carbon Printing

The developing agent used in the process of carbon printing is plain water; and the final image of the picture consists of a deposit of pigmentary matter in a film of gelatine. These two properties give to the process the character of simplicity and permanency which it acquired upon its original introduction: a character of which the competition of many other printing processes has not deprived it. Besides its simplicity and permanency, the process has other claims to notice. The print may be in almost any color desired—from an engraving black to a warm red. The process may be employed for the production of direct contact prints, and for enlargements on paper, fabric, glass, opal and many other supports. Transparencies and lantern slides are made in carbon; and the modern demand for pictures in natural colors is flattered by the application of the principles of trichromatics to the process. It is not only the technician that is catered for in carbon printing: the ever-growing army of pictorialists find their requirements satisfied in this most beautiful and adaptable method of making pictures by photography. So we have the process modified to give images on rough-surface papers, on Japanese tissue, and on other surfaces complying with the latest formularies of esthetic taste. It all comes to this: that in carbon we have at hand a process of forty years' standing which has answered the test of time and experience, and, besides satisfying every reasonable demand of the technician and the pictorialist

for responsiveness of effect aimed at, has, nevertheless, a wonderful facility for yielding to the fluctuations of taste and change. The latest manifestations of this charming plasticity supply the basis of this monograph.

Outlines of the Process

As we have already pointed out, the carbon process is a printing method which by exposure and development gives a print in which the picture consists of permanent pigment, such as carbon, embedded in a thin film or tissue of insoluble gelatine. In its first state carbon paper is a film or tissue of gelatine with which is incorporated pigment or coloring matter, coated on a sheet of paper intended merely to support the film during exposure. By immersion in a solution of potassium bichromate the tissue is "sensitized," i e., acquires the property of becoming insoluble upon exposure to light. When exposed to light under a negative, in the usual way, the tissue is rendered insoluble in proportion to the amount of light which has acted upon it at different parts of the negative image. In development the exposed tissue is washed with water. This causes the soluble portions of the pigmented film (i. e., those portions more or less protected from light by the density of the negative) to dissolve and clear away. By this we get a positive image in pigmented gelatine. The color of the image varies according to the pigment incorporated with the gelatine forming the tissue. The permanency of the print depends upon the permanency of the pigment employed in making the tissue. The exposed film or tissue being transferred (by a simple operation) before development to a second (temporary or final) support, permits of any desired modification in the surface finish or texture of the print, and the choice of a variety of supports, such as different kinds of paper, opal, glass, wood, leather, metals, or other surfaces.

Tissues and Materials

The variety of material and tissues on the market for carbon printing is very great. The Autotype Company supply tissues charged with colored pigments of thirty different colors in rolls and cut sheets for direct printing on paper, for photogravure and transparencies. The tissues of Elliott & Son are also available in fifteen different

colors, and in more recent years Wellington & Ward, and Illingworth & Co., all English houses, have placed tissue and material on the market. It may be noted, that these firms supply trial outfits for carbon printing, a convenience which the small worker should appreciate.

Transfer Papers and Supports

Transfer papers, single or double, are obtainable from dealers in carbon supplies; and some form of temporary support will be required. This is used to support the exposed film in development where the double transfer method is used. The temporary support may be a piece of glass, or opal, or a prepared paper called flexible support—that is, paper coated with insoluble gelatine and shellac, so that it is impervious to water. The surface texture of the temporary support determines the surface finish of the print. Thus, to get matt-surface prints, ground opal or grained zinc is employed as the support; for an ordinary glazed surfaced finish the flexible support, waxed, is used. Celluloid is useful for this purpose. In any event the temporary support must be a little larger all around than the piece of tissue in use.

Apparatus

A thermometer; a scraper squeegee; a few ounces of bichromate of potassium; three pieces of rubberized cloth or waterproof fabric, a little larger in size than the prints proposed to be made; a supply of waxing preparation: a bottle of plain collodion; trays for sensitizing and printing-frames; are the principal requirements for the process, it being assumed that the worker is in possession of most of them in his ordinary practice. The cut tissue should be stored away under pressure except when intended for immediate use. Unless so stored, it has a tendency to curl up around the edges and is unmanageable in the printing-frame. It should not be stored where it will become damp or moldy.

The Process in Practice

The operations for making a carbon print are briefly as follows: The tissue is first cut to the exact size of the negatives from which prints are to be made; it is then sensitized and, after drying, stored away until required for use. In use it is exposed under a negative, immersed in water with a temporary support (or a piece of final

support), squeegeed into absolute contact with this new support and placed under pressure. This transfer of the film to the new support being effected, the tissue, with a support on both sides of the film, is immersed in warm water. In this the original support of the film loosens and is removed, and the picture is developed by laving the film with water. Development completed, the print, now on the temporary support (or final support if it is to be a single transfer print), is cleared in an alum bath, and dried. If the print was transferred to a temporary support, it is again transferred after development to the final support—which may be paper, wood, metal, glass, leather, etc.—and after drying is stripped from the temporary support, which completes it.

If the tissue is bought in cut sizes, of course there is no cutting to size to do. If bought in rolls, a piece of zinc not less than the width of the roll will be found most useful, as the stiff, gelatinized paper curls in a pesky fashion when handled. Two edges of the sheet of zinc should be accurately squared and preferably marked off in inches on these two edges. With this a T-square of proper size is used and the cutting done with a sharp knife, a shoemaker's knife being good for the purpose. With these articles, and weights of some kind to keep the tissue from rolling up, no trouble will be found in cutting it accurately to any desired sizes.

The Sensitizing Solution

The first question in sensitizing is, as to the strength and constituents of the solution. This depends upon a number of factors: first, the season; second, climatic conditions; third, character of negatives ordinarily used, and fourth, the character of results desired. In spring and summer, or in damp, moist climates such as we have in our southern coast states, the tissue has a tendency to become insoluble in drying, owing to the heat and moisture in the atmosphere. In this case it is necessary to add a small amount of alkali, preferably carbonate of ammonia, to counteract this tendency. As it is not possible to use sufficient alkali to entirely counteract this effect without giving rise to other evils, two additional precautions may be adopted, first the addition of alcohol to the sensitizing bath, which aids quick drying and thus

prevents insolubility, and second, the use of less sensitizer in the bath. If one's negatives are unduly dense and strong in contrasts it will be seen that anything which will give the effect of more generally uniform exposure will be of advantage. By the use of more sensitizer in the bath the tissue has the tendency to become insoluble without exposure, this tendency being analogous to sunning down to decrease contrasts in ordinary printing. Therefore, with such negatives in general use we can well afford to increase the strength of our bath. On the contrary, if our negatives are thin and flat, and we desire the utmost contrasts in our prints, it is advisable to reverse this plan and use a very weak bath. If, therefore, we are to adopt a certain sensitizing formula we should be governed by the conditions under which we are to work. Mr. A. J. Jarman recommends the following sensitizing solution for summer use: Bichromate of potassium (C. P.), 3 ounces; distilled water, 100 ounces; glycerine, 30 drops; salicylic acid (dissolved in hot water), 15 grains; carbonate of ammonia, 60 grains. To Mr. Harry Quilter is due the following: Ammonium bichromate, 1½ ounces; sodium carbonate, ¼ ounce; water, 25 ounces. Of this take one ounce and mix with two ounces of methylated (Columbia) spirit. This dries in fifteen minutes. Another sensitizing bath is recommended by Mr. G. T. Harris as follows: Potassium bichromate, 2 ounces; stronger ammonia water (ammonia ·880), 1 dram; sodium citrate, 120 grains; water 60 ounces. Tissue sensitized in this bath is said to keep well even in damp weather. A formula which we used during a summer's work is as follows: Water, 80 ounces; bichromate of potash, ½ ounce; ammonium carbonate, 20 grains. The winter formula retains the carbonate of ammonia as it facilitates development at all seasons, and increases the bichromate of potash to one ounce to the quart of water. As will be seen, this is approximately a 1½ per cent solution for summer use, and a 3 per cent solution for winter use. Some writers advocate the use of a 6 or 7 per cent bath for general use, but under no conditions should the amount of bichromate of potash exceed 7 per cent. On the other hand, if difficulty be experienced in getting

proper contrasts with the negatives in use, the bath may be as weak as one quarter of 1 per cent.

A formula for sensitizing tissue which has especial advantages for warm, moist weather, is as follows: Water, 32 ounces; potassium bichromate, 2 ounces; stronger ammonia water (ammonia ·880) 12 minims. Now add 1 ounce of sulphuric ether to ½ ounce of alcohol and add the mixture to the sensitizing solution. This gives a quick-drying tissue and one which will be found readily soluble in development.

Sensitizing

The sensitizing solution having been made up we have next to apply it to the tissue. We need a deep agate-ware, zinc, or porcelain tray such as is used in negative development, and preferably one or two sizes larger than the pieces of tissue to be sensitized. Into this the sensitizing solution is poured until we have a depth of one inch—not less. The temperature of the solution is important. It should be used at a temperature of between 50° and 65°; never lower than 50°, nor higher than 65°. If lower, reticulation of the film may be caused; if higher the gelatine film may melt and run. In winter there will be no difficulty in keeping the bath at the proper temperature. In summer the tray containing the sensitizing solution should be set within a larger tray containing cracked ice, or preferably a freezing mixture of salt and ice. It is not well to put ice in the tray with the sensitizer. The sensitizing of tissue is most conveniently done at night, so that the tissue will be dry and ready for use the following morning. To sensitize, the tissue, cut to the proper size, is thrust into the solution and completely immersed. A soft brush or sponge is now passed over its face and back to remove air-bubbles, and it is allowed to soak for three minutes.

Drying the Tissue

As quickly as the sensitized sheets are withdrawn from the bath, one at a time, they are placed face down on a clean and well-polished ferrotype plate or sheet of talced glass and squeezed into close contact with the plate. In summer, this plate should be made quite cold with ice before use. The sheets are then set aside to dry in darkness or non-actinic light. If the tissue dries in less

than four hours it is apt to be too insensitive for satisfactory use. If it takes longer than seven hours to dry, the gelatine is apt to become insoluble and the transfer will be difficult to effect. In such a case the prints will almost invariably have the appearance of over-exposure. After drying, the tissue can be stored in black-paper envelopes or in a box with a tight-fitting lid. It should be protected from light and moisture. After being sensitized the tissue gains in sensitiveness, that is, becomes insoluble and if kept too long will become wholly insoluble. The tissue should be used in two, three or four days after sensitizing. In moist, hot weather it will not be usable after five or six days. To find out whether the tissue is too old for use place a piece of it without previous exposure in warm water, gradually raising the temperature. If it does not dissolve at 110° or 120° Fahr., it is not suitable for printing.

Spirit Sensitizer

The introduction of a spirit sensitizer by the Autotype Company has been welcomed by many workers. The sensitizer is applied to the surface of the tissue, which is laid on paper, by means of a Blanchard (or Buckle's) brush, which is a piece of swansdown or flannelette, attached by means of an India-rubber band to the end of a strip of glass. Some of the solution is poured into a small dish and the brush when charged with it is passed over the surface freely and in all directions. It is then hung up to dry in a darkened room. After drying, which takes place in from ten to fifteen minutes, according to temperature, the tissue is ready for printing. A second coating of the tissue renders it more sensitive and better suited for negatives with harsh contrasts. The use of this sensitizer does not diminish sensitiveness, nor does unevenness of the print result. Carbon printers in a small way should appreciate the facility of being able to sensitize on the day of printing; while another advantage of the method is that it enables one to quickly repeat prints which may not be satisfactory in the first case.

The introduction of this Spirit Sensitizer may be said to effectually remove the only tedious operation involved in carbon printing and simplifies the process immensely.

Exposure In carbon printing the image is not visible, the progress of reduction being judged by an actinometer. A form of actinometer in common use is Johnson's; Sawyer's and Burton's are also well-known forms.

The Safe Edge In printing with carbon tissue it is necessary to have a safe edge of the tissue protected from the printing light and left in a soluble condition. This is called the safe edge and without it the gelatine is apt to stick to the tissue backing on the edges more tenaciously than to the transfer paper. This safe edge can be a mask of thin yellow paper, a line of black varnish around the edge of the negative, or the rebate of the printing-frame. An imperfectly opaque mask may cause trouble, especially with improperly kept or over-printed tissue.

Dampness Carbon tissue should not be printed in damp weather; but if this cannot be avoided use a rubber printing-pad in the frame to protect the tissue from dampness as far as possible and transfer it immediately after printing to a tin tube or storage box containing calcium chloride. If the tissue sticks to the negative in the printing-frame, the face of the negative should be lightly rubbed with French chalk and dusted off. This precaution should always be taken in moist, hot weather. In using a negative strong in contrasts, good results can frequently be obtained by exposing the tissue to strong light for a few seconds before putting it in the printing-frame.

The Transfer In coming to the operation of transferring the picture-image, it is necessary to determine whether we will use the single- or double-transfer method. Development of the image from the face of the film will give us merely the lights and shadows of the picture without half-tone; but by transferring the exposed film to a new support we can get at the back or under side of it where the penetration of light is most feeble. In this way we can develop the image and get the full range of tones from the highest light to deepest shadow, the half-tones being held or retained by the hard crust of the face of the film, which received the strongest impacts of light during the

exposure. If we wet the exposed carbon tissue and bring it face down into contact with a piece of paper or other prepared support, strip off the original backing of the tissue and develop the image from the back of the film thus exposed, the picture will be reversed with regard to left and right on its new support. For many subjects this reversal is of little or no importance; hence, the single-transfer method is largely used for pictorial work and in portraiture. But where things must be represented in their proper places, we must again transfer the image to another and final support, which puts the lefts and rights as they are naturally seen. In the double-transfer method, the exposed print is first transferred to a temporary support, developed, cleared in alum solution and washed. It is now transferred by being brought into contact with a piece of final support or double transfer paper, or any other desired support, squeegeed and set aside to dry. When dry the temporary support is easily stripped away and the picture remains on the final support.

Single Transfer

By the single-transfer method we can make prints on paper, opal, glass, etc. Specially prepared paper can be bought in rolls or cut sizes and in several varieties of thickness and color, such as thick or thin heavy hand-made, smooth or rough in finish and heavy cream-tinted drawing-paper. The paper should be cut to sizes a little larger than the carbon tissue, and not smaller, as in such cases one of the edges may fall within the safe edge of the tissue and allow the backing to carry off a part of the image. In making the transfer the printed tissue is placed face down in a tray of cold water, 50° to 65° Fahr. and at the same time a sheet of the transfer paper is placed in the same or an adjoining tray, care being taken to remove all air-bubbles from both. In from thirty to sixty seconds, the tissue will be found to flatten out and finally will begin to turn up at its edges, film inward. When it begins to curl in this way it is brought face to face with the limp piece of transfer paper or other support, drawn out upon a squeegee board or zinc plate, and the two papers, with the film between them, are squeegeed into absolute contact, being cov-

ered with a piece of rubber cloth. A scraper squeegee must be used for this. It is essential that all water be expelled between the two pieces of paper, and that the contact of the surfaces shall be absolute, without any air-bells, etc. The two closely adhering sheets are then placed between blotters and put aside under evenly distributed pressure. After all the prints awaiting development are transferred in this manner, and placed in a pile with blotters between, they are left for twenty minutes to an hour or more, according to the pressure upon them, after which they are ready for development. The purpose of placing them under pressure is to ensure even adherence of the tissue to the transfer paper. With thin, smooth transfer paper this may be effected in ten minutes, but with the heavy rough papers an hour may be better. In using the rough papers, moreover, it will be well to soak the transfer paper itself for a half hour or so in cold water before making the transfer, afterward placing the adhering sheets under very heavy pressure. One test of the sufficiency of the time the prints are under pressure is to note whether the back of the transfer paper is stained yellow by the bichromate of potash in the gelatine film. If the print is to be transferred to matt opal or glass, instead of paper, for its support, these should be free from flaws of any kind, clean and free from grease, and coated a few hours previous to use with a solution of albumen. This is prepared by beating the whites of three eggs to a froth and adding one ounce of water with five drops of liquid ammonia, giving a thin viscid solution. Plates coated with this should be free from dust and have an imperceptibly fine film, which, acting as a substratum, holds the bichromated film firmly during the after development of the exposed tissue.

Development After the prints have been under pressure for a sufficient length of time, they are immersed separately in a large tray containing a supply of water at a temperature of from 90° to 100° Fahr. They should be rocked for a few minutes and all air-bubbles removed. It will be noticed that the gelatine around the margin has begun to dissolve and is oozing out of the edge of the transfer paper.

When this has gone on for a few moments more, remove one of the prints to another tray containing water at from 100° to 110° Fahr. This is the developing-tray and the water should be kept as nearly as possible at the temperature stated. This can be effected by placing the tray, a tin or zinc one, over a gas or an oil stove with flame adjusted to the proper height. After being in this warmer water for a moment the print is ready for stripping. Take one corner of the tissue backing and, with the other hand holding the print under the surface of the water, gently strip off the backing. If it comes off readily it is an evidence of correct or under-exposure, but if it seems disinclined to strip, this is an evidence of over-exposure or partial insolubility of the tissue, and it should be allowed to remain longer in the warmer water. If the printing was correct the backing will leave behind it on the new support a thick gelatinous mass in which at first no detail can be seen. By gently rocking the tray this mass will dissolve away and gradually the image will appear. Now lift the tissue and carefully place it, face up, on a slab of glass inclined at an angle to the bath and gently lave the image with the warm water by means of a glass, cup or large spoon. The details will gradually brighten up and in a minute or so the image will be fully developed. As soon as the print is developed a little lighter than it is to be when dried, as it darkens upon drying, it should be placed in a tray of cold water to stop development.

Fixing

The fixing or clearing bath hardens the gelatine film and eliminates all traces of the bichromate of potash which might remain in the film or paper after development. The alum bath is a 5 per cent solution of powdered alum in water. This bath must be filtered before use and may be used repeatedly. The prints remain in it for from ten minutes to an hour, the former when thin paper is used, the latter when using the heavy, rough papers. If there is any yellow stain from the bichromate of potash in either the print or single-transfer paper or in the temporary support, the immersion in the alum bath must be continued until the tint has disappeared. The prints are then washed for half an hour in gently

running water, or in several changes, and hung up by clips until thoroughly dry.

Double Transfer

In the double-transfer method there is choice of a variety of temporary supports and the final support on which the finished print remains may be almost any surface desired, as paper, wood, ivory, glass, opal, celluloid, canvas, leather. To make a double-transfer print on paper, we will suppose the reader is using as temporary support the commercially supplied flexible support. This is paper coated with insoluble gelatine and shellac, it is sold in rolls and cut sheets and may be used repeatedly. Before using it must be waxed, i. e., a thin film of wax must be spread over its entire surface. After each time of using, also, this "flexible support" must be thoroughly dried and again waxed before use. The waxing preparation can be bought, or made as follows: dissolve yellow resin, 6 drams, and pure beeswax, 2 drams, in one pint of turpentine. This waxing solution should be used some time before the support is required, so that the turpentine has time to evaporate. To apply the wax coating, put a little of the solution on a piece of flannel or wad of absorbent cotton; lay the sheet of temporary support on a board or table and rub the wax lightly over the face of the support. When all the supports have been waxed, go back to the first sheet and, with a large tuft of absorbent cotton, polish each sheet in turn. Care must be taken not to rub the wax off entirely at any point; what is needed is a thin film of wax over the whole surface of the support. All temporary supports, flexible or rigid, as opal, celluloid, must be waxed in this way before they are used.

The Final Transfer

The exposed tissue is first transferred to the temporary support, developed, alumed and washed as already described. The second transfer to the final support can be made while the prints are still wet from the first transfer, but is preferably made after they have been permitted to dry. The double-transfer paper or final support can be bought in rolls or cut sizes. It does not keep well, hence too large a quantity should not be bought at one time. It is a plain paper coated with gelatine or alum.

To make the final transfer, first soak the final transfer paper in water at 90° to 100° Fahr. until the gelatine surface is soft, spongy, or slimy, the idea being to get a perfectly soft, yielding bed for the carbon image on the temporary support. Place in a tray of cold water for a moment, with the carbon image on its temporary support, and withdraw the two together to avoid air-bubbles. Squeegee lightly but firmly and clip up in a dry room. In five or six hours, if then thoroughly dry, insert the point of a knife between the temporary and final support and pull the two apart. If the former has been properly waxed and the final transfer paper was in good condition and properly soaked, the carbon image will be found to have adhered to the gelatine surface of the final support and will leave the less tenacious waxed surface of the temporary support, thus giving the second transfer and a non-reversed image. The surface of the image will now have a finish exactly corresponding to that of the temporary support employed. If the final support is so old that the gelatine surface has become partly insoluble and will not soften, soak it in water at a higher temperature until it is soft and spongy. If even with quite hot water it will not become soft, the paper is probably worthless and should be thrown away. When soaked in water at a higher temperature than is absolutely necessary to soften the gelatine coating, the latter is apt to be washed off generally or locally and all or a portion of the picture will be left on the temporary support. The same thing will happen if the temporary support has not been properly waxed. If there is any wax on the carbon image after stripping, it can be removed by rubbing gently with a tuft of absorbent cotton dipped in wood alcohol. The print is now finished and can be trimmed and mounted. From this introduction to the principles and practice of carbon printing we proceed to a digest of many of its latest modifications and applications.

Sensitizing Modifications

One of the best known carbon workers, Mr. Henry W. Bennett, F. R. P. S., published some time since in *Photography* the results of a number of experiments in modifying the sensitizing bath for carbon tissue. We abstract the

essential portions of this valuable paper, one of the most important in relation to the subject that has recently been issued, inasmuch as the author claims to have succeeded in controlling the gradation, detail and other qualities of the finished print by these additions to the sensitizing bath. In this, the latest work devoted to carbon printing, Mr. Bennett's paper very properly finds a place:

Various Sensitizers

Sodium Carbonate. — The results obtained by adding sodium carbonate to the sensitizing bath have been very promising, and for some special cases equal to those given by any other substance. The quantity that could be added with success required gauging very carefully, as it was found that if sufficient to ensure solubility and easy working were used, other difficulties were introduced; and, as a much smaller quantity would give improved gradation, another addition was made in combination with sodium carbonate to secure good working qualities, which will be described in a later paragraph. The effect is to lengthen slightly the gradations at the light end of the scale. *Potassium Carbonate* is very similar in its effect to sodium carbonate; a smaller proportion is sufficient to produce the same degree of modification. *Neutral Potassium Citrate.*—This salt has been added to the sensitizing bath by Professor Namias for conferring keeping qualities; and in testing it for my purpose—securing improved gradation—it was found to have a very marked effect. Used alone, however, the general working qualities of the tissue were no better than when a plain neutral solution of bichromate was used, but these qualities were easily secured by a further addition to the solution. *Sodium Citrate* may be substituted for the potassium salt, the differences are inappreciable. *Citric Acid.*—Although from the conditions recognized as being essential for the successful working of carbon tissue, especially when bath sensitized, this salt appears to be one of the least desirable additions to the sensitizing solution; yet it has given the best results in every respect. A small proportion produces a decided difference in gradation; the results can therefore be easily controlled or modified.

The inherent defect in bath-sensitized carbon tissue

is the loss of gradation at the light end of the scale, the general effect being that which would be produced by exposing tissue to light and so fogging it or degrading its purity; and this grey veil robs the lighter tones of all their value, gradation, and brilliancy, and it still remains even if the portions of the print protected by the safe-edge are quite clean. By no care or precaution in drying have I been able to overcome this defect, and those most experienced in working the carbon process have invariably stated that bath-sensitized tissue is distinctly inferior to that sensitized in course of manufacture. It has been this defect more than any other that I have endeavored to remove, and the results obtained are not only thoroughly satisfactory, but from the data given, they can be modified by each worker as he may desire. Taking the substances named, they may be placed in the order in which they have been described, sodium carbonate producing least effect, and citric acid being unquestionably the best, and also offering the greatest power of control. It is absolutely essential, however, to neutralize, or more than neutralize, the acidity of the solution; and the method of obtaining an alkaline bath is the determining factor in securing good working qualities.

Ammonia

I have only succeeded in sensitizing tissue that would be as satisfactory in its ordinary working qualities as freshly-made sensitive tissue, by making the sensitizing solution alkaline with ammonia, whatever substance had been added for modifying the gradation. Although various degrees of alkalinity have been tested experimentally, that which has been found to be the most satisfactory and the most simple to determine has been to add ammonia to the sensitizing solution, after all the other ingredients have been dissolved, until the orange-red color of the bichromate changes to a lemon-yellow; and the smallest possible quantity of ammonia that will effect this change should be used. This amount will vary with the different substances or quantity of such substances added. In my earlier experiments with the carbonates, sufficient of these was added to the solution to effect a similar change, as the value of this condition

of the bath was recognized; but, in all cases, the results obtained were very inferior in many respects to those resulting from a smaller proportion of carbonate with sufficient ammonia added to complete the change. For obtaining good working qualities—solubility, freedom from brittleness in developing, etc.—the value of ammonia cannot be over-stated; and although its full effect is most noticeable when added to a strong solution of simple bichromate—the most satisfactory sensitizing bath—yet its efficacy does not appear to be impaired by any of the substances given in this article, but as they modify the tissue, the effect of ammonia has to be examined carefully by comparative tests.

Formulæ

In all the following formulæ the quantity of ammonia, represented by x is determined by the method given in the paragraph on ammonia: *A*. Potassium bichromate, 1 ounce; citric acid, ¼ ounce; ammonia, x; water, 50 ounces. *B*. Potassium bichromate, 1 ounce; citric acid, ½ to 1 dram; ammonia, x; water, 50 ounces. *C*. Potassium bichromate, 1 ounce; potassium citrate, ½ ounce; ammonia, x; water, 50 ounces. *D*. Potassium bichromate, 1 ounce; sodium carbonate (crystallized), ½ ounce; ammonia, x; water, 50 ounces.

In all cases the solids were dissolved separately and their solutions mixed.

The solutions will keep well in stoppered bottles. As a small quantity can be used if the tissue is kept flat—four or five ounces for six pieces 6½ by 8½ inches—the used solutions should be thrown away, or a larger quantity may be taken and used several times if fresh stock solution is added each time. A solution used too many times will give uncertain results.

Results and Conclusions

For general work solution *A* should be used, as it secures the finest possible gradation in the lighter work, a full scale of tones, good shadow detail, and contrast without harshness. From a negative suitable for carbon printing a rich tint can always be obtained, as the tissue should be very uniform in quality and conditions at the time of using. The difference between the various formulæ is entirely in the gradation resulting in the

lighter tones. Solutions *B* or *D* may be used for under-exposed negatives in which the lighter tones are relatively too strong or harsh, or for any work when the gradation at the light end of the scale is too strongly marked and requires softening down. Solution *C* gives a result similar to *B* with the larger quantity of citric acid. Formulæ *A* and *B* are preferable to *C* and *D*. The proportion of water may be varied according to the degree of contrast required, a stronger bath giving less contrast and vice versa. This strength will be found best for general work. The method of sensitizing adopted has been to immerse the tissue face downwards in the solution for ninety seconds, then lay it face down on a sheet of glass and squeegee gently to remove as much solution as possible, and if any surface moisture should remain on the back rapidly remove it with blotting-paper; then lift it by two corners and gently pull it from the glass, and hang it to dry.

Drying

Tissue sensitized by these formulæ is practically independent of drying conditions, provided that it dries within a moderately uniform time, from four to six hours. *Gas in the drying room has little or no effect.* In general working the tissue has been in the highest degree satisfactory, and very pleasant to use after working ready-sensitized tissue that had been kept in a box with calcium chloride. It is extremely soluble, dissolving very gently and easily at a temperature of 100 degrees; the backing paper is very easily removed after a few seconds' immersion in the developing-tank, and there is not the slightest tendency to blister, nor break, nor to produce any mechanical defects even when development is very prolonged. In almost all cases the tissue has been sensitized at night and used the following day, and no special precautions have been taken between drying and using, the tissue being simply put in an ordinary cardboard plate-box. As an experiment, some was left freely exposed to the air for eight to ten hours after drying, and no difference could be detected. As most of this work has been done during the present summer, the wet weather has been a severe test of the efficacy of the methods adopted, both in regard to drying the tissue and its after-working.

Speed

Tissue sensitized by the solutions given is considerably slower than that sensitized in the plain potassium-bichromate bath, but the gain in quality more than compensates for the loss of rapidity.

Although commercial tissues differ so much in speed when purchased sensitive, yet when sensitized on these baths they are all practically identical, excepting the new matt-surfaced tissues, which require only three-fifths of the exposure of the ordinary kinds. Black tissue will be approximately the same speed as Ilford P. O. P. when sensitised in bath A, so that if a narrow strip of this paper is placed along one side of the negative, it may be printed until the light tones are just as dark as required in the carbon print, and an actinometer dispensed with. Brown tissue will require rather longer exposure than this, about one-fourth, and red-chalk about one-third longer than black, or until the silver strip is dark enough for toning. Formulæ *B*, *C*, and *D* yield a tissue slower than that produced by *A*, the proportionate exposures necessary being approximately $A = 4$, B and $C = 5$, $D = 6$.

Keeping Qualities

I have tested the keeping qualities of tissues sensitized on these baths, always sensitizing a piece in a plain solution of potassium bichromate, and keeping under identical conditions for comparison. The method of storing has been under the pressure of an ordinary printing-frame — a method that would be effective with ordinary P. O. P. for many weeks. Ten days has been the test time, and although the results with some sensitizers have been superior to that given by the simple bichromate solution, yet in no case have the prints been so good or so clean as freshly sensitized tissue. The "safe-edge" has always been degraded, and the prints poor in quality. The solutions containing ammonia have been the most satisfactory, though far from good.

Carbon on Celluloid

Among the many final supports available in carbon printing, whether single or double transfer, celluloid finds a prominent place, being largely used by professional workers because of its surface finish, which is peculiarly

adapted for portraiture. The celluloid should be sufficiently stout to prevent buckling, with a fine matted surface on one side.

Assuming that the tissue has been exposed beneath a negative and is ready for development, the following substratum must be at hand, having been previously prepared. It is composed as follows: Gelatine (Heinrich's hard), 2 ounces; water, 12 ounces; sugar, 2 drams. Allow the gelatine to soak for an hour. Meantime prepare in a separate vessel a solution of chrome alum, 15 grains; water (hot), 1 ounce.

The gelatine, water and sugar should be put in an earthen vessel, or prepared in a small, oatmeal-kettle (popularly known as a double boiler), so that the water boils around the pot or inner vessel and causes the liquefying of the gelatine. As soon as the gelatine is well melted and very hot, the hot chrome-alum solution may be added drop by drop, stirring the gelatine solution vigorously at the same time. Keep up the stirring for a short time after the last of the chrome-alum solution has been added. Then filter a small quantity of this into a cup or small pot, and as soon as it has cooled down slightly it will be ready for use.

Single Transfer

Have at hand a mixture of acetic acid, 1 ounce, water, 6 ounces. Take the pieces of celluloid, cut to a size somewhat larger than the tissue to be transferred, and rub the matt surface well with a piece of canton flannel, dipped into the acetic-acid mixture, until the surface is quite clean. Rinse under the faucet, and lay in a tray of clean water for use. For single transfer, take a piece of the celluloid in the left hand by one of the top corners, and pour on some of the gelatine substratum while warm, having the exposed tissue soaked in clean water. Lay it upon the gelatinized celluloid, which must be in position on the squeegee board. Directly upon the top of the tissue place a piece of India-rubber cloth, smooth side uppermost. Then apply the squeegee gently at first, increasing the pressure until all the excess of substratum has been squeezed out. Lift the cloth carefully, wipe off all the remaining substratum with a wet sponge, and put the print aside until the remaining pieces of

exposed tissue have been treated in a similar manner. In the course of a quarter of an hour development may be proceeded with.

This is best commenced by laying the prints in cold water to allow them to soak for about one minute. Then place them in warm water, and allow to soak until the tissue begins to loosen. Now lift the tissue by one corner, throw it aside in the waste-basket, and proceed with the development by throwing warm water over the surface of the print with the right hand, holding the print by one corner with the left hand. In the course of a short time the print will be seen to be fully developed. It must now be carefully rinsed in a stream of gently running water, and placed in a tray containing a solution of common alum (not chrome alum), three ounces of alum to one hundred of water. Allow the print to remain in this for five minutes only. Then, after soaking in another tray of clean water for five minutes, the print may be washed in a gentle stream of water and hung up to dry.

Double Transfer

To produce carbon prints upon celluloid by double transfer, the process must be modified. Clean the celluloid as previously described, rinse under a faucet, drain, and while still wet pour over the matted surface the same substratum, draining the remainder back into the containing vessel. A large piece of celluloid may be cleaned and coated in the same way, four 5 x 7 pieces being cut therefrom when dry. As soon as the pieces of celluoid are coated they must be laid aside to dry in a clean rack.

The carbon print is developed upon a flexible support as in paper transfer, and dried. This being done, take a piece of the celluloid with its dried coating of substratum, cut it to a size a little larger than the print, and place it to soak in the 3 per cent alum solution described above. Meantime place the flexible support containing the print into clean water to soak for about fifteen minutes. The celluloid may be removed from the alum bath, and washed under the faucet. It must now be coated once more with the hot substratum, laid upon the squeegee board, and the wet print on the

flexible support laid upon it. Cover this with rubber cloth as above mentioned, and apply the squeegee carefully and lightly, gradually increasing the pressure.

After about eight or ten strokes of the squeegee remove the cloth, and wipe the back of the support carefully until it is free from gelatinous solution. Then very carefully lift the celluloid and support together, starting this lifting by inserting the tip of the blade of a knife at one of the corners. Now suspend the celluloid, with the attached flexible support, to dry. When dry the support will come away freely from the celluloid. All that is necessary now is to place the celluloid, which will now have the print firmly attached to it, into a tray of warm water for half a minute, then pass it through a tray of clean water and suspend to dry. As soon as the drying is complete it will be seen that the print is perfect in every particular.

The substratum will keep in good working condition for about one week by the addition of a few drops of 10 per cent carbolic-acid solution.

Preparing Special Papers

Despite the great variety of transfer papers or supports commercially available, many workers prefer to prepare special papers for their own use, thus securing effects in surface finish, texture and color not obtainable with the papers generally offered in the market. The following method is applicable to all classes of paper: Take of Nelson No. 1 gelatine 4 ounces, and let it soak for two hours in 25 ounces of warm water; then melt over a slow fire in a water-pan. Put the gelatine into a jar, and set it in a pan of water over the fire and thoroughly dissolve, stirring it all the time; when dissolved add very slowly 60 grains of chrome alum, previously dissolved in 4 ounces of water. Stir all the time it is being added; this will solidify the gelatine. Collect, and restore it to fluidity with as much glacial acid as is necessary. Now take the sheet of paper to be coated ready for receiving the carbon tissue, and pin it at all four corners on a board, and into the center pour a good supply of the mixture; for an imperial sheet, say 2 ounces. Take a brush and roughly go all over the paper with it; then take a flat squeegee

and press it all over the paper, now backwards, then crossways, so that all the paper receives a good coating, but leaving as little on the paper as possible, except in the case of rough papers, which require a more liberal treatment. All that is squeegeed off the paper may be gathered up and returned to the pot for further use. Two ounces will leave plenty to return to the pot, but it is better to be liberal with it at the start. Hang up the paper to dry, and it is then ready for use.

Single Transfer Paper

Any good white sized paper may be made into a single transfer paper by rendering it waterproof. Immersion in acid-proof varnish (which may be diluted with alcohol for this purpose) will do this perfectly; or, in a lesser degree, it may be done by immersion in a solution of shellac, made by boiling three parts of shellac and one part of borax in thirty parts of water. Or an alcoholic solution of bleached shellac may be used, the object being simply to close the pores of the paper and make it sufficiently waterproof.

Transferring Prints to Rigid Supports

The print should be allowed to dry after development and transferred to the final support with a solution of gelatine made up as follows: Gelatine (hard), 1½ ounces; water, 20 ounces; chrome alum (saturated solution), 2 ounces.

Soak the gelatine until it has absorbed all the moisture it will (which will take about half an hour) then dissolve with heat (it is advisable to use hot-water bath), and add the alum. It is advisable to filter this solution through fine muslin as there may be some insoluble particles. Run the solution into a flat dish, which is kept warm in a hot-water bath. Cut the print a little smaller than the final support, allow it to remain in the solution until it is quite flat, squeegee the two together, bringing them in contact *under the solution.* When dry the temporary support should strip off readily. All traces of the waxing solution can be removed with benzol.

Transferring to Canvas, Silk, Etc.

To prepare canvas for carbon prints, the canvas should be stretched upon a flat board and scrubbed well with soda solution until the canvas shows through the sizing. The

canvas is then dried and coated with the following solution: Gelatine (cooking), 4 ounces; glycerine, 2 ounces; sugar, 2 ounces; water, 30 ounces; chrome alum (saturated solution), 1 ounce.

Three to four coatings of this solution are necessary, dry between each coating and rub down any unevenness with fine sandpaper. The print is developed in the ordinary manner on temporary support and when dry is placed in the solution until flat; the canvas is then brushed over with the solution. Pour a quantity of the solution over the canvas and before it has time to dry, or rather set or run off, lay the print on and squeegee to the final support. The support is removed in the usual way when thoroughly dry. For other fabrics such as silks, linen, or calico, follow the instructions above; if it is found that the material works up rough when applying the solution, use the sandpaper freely until a smooth surface is obtained.

Prints on Metallic Supports

Carbon prints upon metal surfaces are invariably produced by single transfer, so that the developing is made direct upon the metal. If the plate should be made of brass, nickel-plated copper, or a bronze of almost any description, then it is advisable to use a preliminary coating of collodion. This is necessary because the chromic acid, which forms the base of the bichromate of potash (used to sensitize the tissue), attacks the zinc contained in brass, or the nickel coating on copper, or any nickel alloy, combining with the nickel or zinc and liberating copper in a free state, giving spots and patches of copper upon the surface. Collodion, being an inert body, acts as a neutral layer upon the surface of the alloy.

Preparing the Surface

If it is desired to produce a grained surface upon, say a plate of copper or aluminum, proceed in the following manner: Clean the copper plate well by dipping it into, and rubbing it with a small rag mop dipped into a solution of lye. This solution is made by dissolving a small quantity of potash lye—about four ounces dissolved in one quart of warm water; allow it to cool off before use. The copper plate must be planished and polished previously. Having cleaned the plate with the potash

lye, wash it well and dry. When dry, brush the back of the plate over with shellac varnish, or asphaltum varnish. Allow to dry in a warm place. The plate should be handled by the edges only, the fingers not being allowed to touch the surface. The surface of the plate must now be rubbed well with a stick of charcoal such as is used by photo-engravers. Dip the plate and charcoal into water; lay the plate upon a smooth board, inclined over a sink so that in rubbing the surface backward and forward the surface grinding drops into the sink. The graining is produced by immersing the well-cleaned copper plate into a mixture of nitric acid, 1 ounce; water, 20 ounces. If the graining is to be coarser, the water must be reduced to 15 ounces. In the course of a short time it will be seen that the surface of the copper has been attacked by the acid. Rock the tray a little, and in the course of a minute or two, remove the plate, rinse it in running water, then scour the surface with a fine brass-wire scratch brush. This can be done by hand, or if possible use the rotary scratch brush in a scratch-brush lathe of a silver-plater. The object of the scratch brushing is to rub down any slight bur formed by the etching of the acid. The plate may now be washed by dipping into hot water. It will dry by its own heat. If aluminum be employed, hydrochloric acid (muriatic acid) must be used instead of nitric, because nitric acid will not attack aluminum except at a high temperature. The proportion of hydrochloric acid may be the same, with the addition of half an ounce of common salt. This lessens the intense action of the acid. The scratch-brushing must be resorted to as before, rinsing the plate, dipping into hot water and drying.

Transferring

Assuming now that a carbon print has been produced upon the tissue in the usual way, all that is necessary will be to take the copper, silvered, or aluminum plate and dip it in the lye. Rub lightly with a soft cotton mop, rinse in clean water, and as quickly as possible soak the exposed tissue. Dip the tissue and metal plate into a syrup composed of white granulated sugar, 1 pound; water, 1 pint. This solution must be used cold.

Place the soaked tissue and plate together; cover with a piece of India-rubber cloth, glazed side uppermost, place upon a level surface. Now apply a squeegee, lightly at first, then gradually increase the pressure at every stroke, not rapidly but with a slow heavy pressure. If several plates are used, some bright, some grained, the treatment is the same. Allow the plates to stand for fifteen or twenty minutes before developing. At the end of that period, place them in cold water, allow to soak for a minute or two, then transfer them to a larger tray containing warm water. Rock the tray so as to get rid of the air-bubbles on the surface. Take the first tray, half fill it with water of a somewhat higher temperature, take one of the metal plates out of the warm water, immerse it, then carefully lift the tissue from one corner. All that will be necessary now will be to throw the warm water over the surface of the plate with the right hand while holding the plate in a sloping position with the left hand. In a very short time the print will be fully developed. Wash it by dipping into clean cold water, then immerse in an alum-bath compound of common alum, 2 ounces; water, 100 ounces. The plate must remain in this bath for not more than five minutes, because the film should not be hardened too much, Proceed in the same way with the other plates, and after the alum bath, wash them by laying them in clean water from tray to tray giving a five minutes' time to soak, so as to completely remove the alum. They may be placed in a clean rack to dry.

Prints on Ivory

Should the ivory have any scratches upon its surface (they will be visible after immersion in water) it should be polished with a piece of fine "velvet" cork and a paste made with cuttlefish powder and water; then wash in distilled water, and dry with a soft cloth. Make a solution of Nelson's No. 1 gelatine 1 ounce, water 20 ounces. Soak the gelatine in the cold water until soft, then dissolve by gentle heat. In another vessel dissolve 12 grains of chrome alum in an ounce of warm water, and pour it slowly, in a very thin stream, into the gelatinous solution, stirring rapidly all the time. The ivory need not be "coated" in the usual sense; proceed as

follows:—Put the picture on its temporary support in cold distilled water until it is quite flaccid, then immerse the ivory and the print in the warm chrome gelatine solution, and bring their surfaces together. Remove together carefully (avoiding air-bells), and then apply the squeegee very gently, with just enough force to expel the surplus gelatine. When quite dry, the temporary support may easily be removed.

Prints on Japanese Tissue

Assuming suitable negatives and subjects, carbon prints closely resembling photogravures in richness and depth of color can be obtained by the use of Japanese tissues as the final support. In this method the Japan tissue is placed on a glass support, the paper being cut somewhat larger than the glass, when it is coated with a plain collodion made up as follows: alcohol, sp. gr. 0.81, 100 parts; ether, sp. gr. 0.72, 100 parts; pyroxyline, 5 parts. Old celluloid films can be dissolved in amyl acetate, or equal parts of alcohol and ether, and used for the same purpose. With a camel's-hair brush, about one inch in width, commence at one edge of the paper on the glass support, and as rapidly as possible, using the collodion freely, coat the whole of the paper, at the same time pressing it into contact with the glass as intimately as the brush will permit. This first coating should thoroughly dry, when it will be found that the paper will be drawn perfectly flat to the glass support, if the coating has been properly done. Two or three additional coats should be applied until the pores of the paper are closed, but not enough collodion used to give the Japan tissue support too much gloss and destroy the texture of the paper. After the paper on the glass is dry, bend back the surplus paper over the edge on to the back of the glass support, and hold it there by placing it on another glass, keeping the two together during the development of the carbon print. This will prevent the water from getting between the print and the glass, and lessen the possibility of tearing the print. Sensitize the carbon tissue and print as usual. When ready to squeegee the printed tissue to the prepared Japan tissue support, immerse the print and the tissue support in the water at the same time and squee-

gee as usual. No previous soaking of the tissue support is necessary. In twenty minutes development can proceed as usual. The print during development should be examined with some white opaque substance behind it, or it will probably dry out too dark. The finely divided coloring matter can be thoroughly removed from the print, when sufficiently developed, by flooding with alcohol *once*, in the same manner in which a plate is flowed with developer. The print can now be rinsed and placed in alum or sodium bisulphite to eliminate the bichromate, washed again, and permitted to dry on the glass support. After drying, it should be carefully stripped from the glass and is ready for mounting. The tone of the picture can be modified by backing the print with colored paper. If old collodion is on the glass, the print will be almost sure to stick. Rubbing the glass with talc will facilitate the removal of the print. If the collodion is *flowed* on the paper, the result will not be satisfactory; the collodion *must* penetrate the paper instead of setting on the surface.

Auto-Pastel

Auto-Pastel is a pigmented paper, somewhat similar to carbon tissue. It is supplied in eight colors: Sepia, indian-ink, light red, dark red, green-black, blue-black, dark blue and dark green; the whole sheets are 15 x 24 inches, and the half sheets 12 x 15 inches; they may be obtained in assorted colors. The paper is supplied in an unsensitized state, but the operation of sensitizing is simple, the paper being immersed for one minute in 5 per cent solution of bichromate of potash, and dried in a dark, warm room; the drying takes about half an hour. It is not advisable to sensitize the paper and store it for long periods; it should not be kept for longer than about eight days after sensitizing. Printing is carried out as in the carbon process, and the negative should be fairly strong. Full exposure may be given, as there is plenty of latitude in development. The continuating action of light after removal from the printing-frame is the same as in the carbon process, and allowance should be made for this if development is to be deferred; the sooner the print is developed after removal from the printing-frame the better. After removal from the frame, the paper is

first soaked for a few minutes in cold water, and then transferred to a dish containing hot water of a temperature from 125° to 150° Fahr. The object of first soaking in cold water is to ensure uniform action of the hot water. The paper is floated in the hot water, face downwards, for two or three minutes, the dish being kept moving. It is then turned face upwards, and development is begun by gently brushing the surface in all directions with a three- or four-inch camel's-hair brush. beginning at the edge and working to the center. It is imperative that development be carried out *under water*, and that the brush should be used with a *sweeping*, and not a stippling action, gentle rubbing being all that is necessary. In a few minutes the image will begin to appear, and the worker may then control development, making it local or general, to suit his own taste. On completion of development the print is washed in cold water and dried. During development it is not necessary to keep the water at a constant temperature, although it should not be allowed to get too cold. The surface should always be kept under water, as once the print dries, it cannot be altered by re-immersion.

Trichrome Carbon

In the Autotype Trichrome Carbon process negatives of colored objects are taken on color-sensitive plates, which are used with ray filters or screens as in orthochromatic methods. The negatives are then printed on tissues of suitable colors, viz., red, blue, and yellow. The resulting images are developed and superimposed on one support. The tissues, yellow, red and blue, are sensitized, dried and printed in the ordinary way, the negatives being provided with safe edges. The exposure, however, differs somewhat from the ordinary carbon printing. The negatives being very thin, the exposures are more rapid than with ordinary tissues. The following has been found to be the approximate ratio of exposure: blue, 2; red, 3; yellow, 8. After exposure the prints are squeegeed on semi-transparent, temporary supports and developed in water at 95° to 100° Fahr. After development they are rinsed in cold water and placed to dry. The best support for the final transfer of the prints has been found to be the single transfer paper.

The pieces of this it is intended to use should first be placed in cold water for half an hour and then, before use, into hot water, 140° Fahr., for fifteen minutes. When ready take a sheet of this paper and place in a dish of cold water and immerse the yellow print at the same time. Place the yellow print face to face with the transfer paper under water, lift both out together in close contact and hang up to dry. It is not necessary to squeegee. When the print has become dry, raise the support at one corner with a sharp knife, and then run a paper knife between the two to separate them. The yellow print having been successfully transferred, the red print is next taken up. Before attempting to transfer the red print, it is necessary to remove from the yellow print every trace of the waxing solution. This is done by rubbing the print over with a piece of rag wetted with benzole and a little whiting. Both the red and blue prints are transferred in the same manner. The yellow print, on its final support, is immersed in clean, cold water, and when flat is laid in the transferring solution face upwards. Soak the red print in cold water, and place that also in the solution face downward upon the yellow print, avoiding the air-bells. Lift both out together and lay them on a sheet of glass. The semi-transparent nature of the temporary support allows the prints to be easily examined by transmitting light, and the registration of the superimposed images is easily effected. The images resting on a glass are now stood on one side to drain, the two being then detached from the glass and hung up to dry. The transfer of the third, or blue print, is accomplished in exactly the same mander, including the treatment with benzole. No alum should be used until the final print has been transferred, then the threefold compound picture may be placed in a very weak solution of formaline. Accuracy of registration is facilitated by placing on the negatives at diagonal points two tiny black dots, which will appear white in the resulting prints. These white dots are pierced with a needle on the dry prints and brought together during the transfers. If they fit accurately it may be assumed that the registration is correct. The transfer solution is made as follows: Nelson's No. 1

cut gelatine, 1 ounce to 60 ounces of water. This is drained before use and employed at a temperature of not over 90° Fahr.

Printing by Magnesium

The following method of carbon printing by magnesium light, given by G. H. James in the *Amateur Photographer* a few years ago, will interest those who think themselves obliged to use gaslight papers and print at night because the daylight hours must be given to more serious business. It requires, in addition to sensitized carbon tissue, an actinometer of simple construction (which will serve equally well for daylight work), and a supply of magnesium ribbon which can be obtained from any photographic dealer at a cost of about 60 cents (2/6).

To make the actinometer, cut nine pieces of thin bond or post paper, each one inch wide and respectively 9, 8, 7, 6, 5, 4, 3, 2, and one inch in length. Beginning with the nine-inch piece and taking them in order according to their length, paste these one over the other so as to form a strip having nine graded thicknesses, each division having one less piece of paper than its neighboring division. Placing this graded screen in a printing frame and exposing a rapid plate behind it for five seconds at a distance of two feet from an ordinary gas flame, we get, on development, a negative with a series of graded densities, starting with absolutely clear glass at one end and ending with a square of considerable opacity at the other. Cut off the two squares of least density, and, beginning with the lowest density, number the squares in plain black or transparent figures from one to seven. Number one will correspond to the density of a thin negative, such as is used in contact bromide printing, while number four will correspond in density with a fairly strong negative, such as is used in platinum printing, and so on. The actinometer is now ready for use, the point for comparison between the actinometer tint and the negative in use being the densest part of the negative.

The following table, based on practical experience, gives the different lengths of magnesium ribbon required in the exposure of negatives corresponding to the various tints of the actinometer described :

Actinometer tint	Magnesium ribbon	Distance between negative and light	Length of time burning (about)
1	2½ feet	4 inches	1½ minutes
2	4½ feet	4 inches	2½ minutes
3	6½ feet	4 inches	3½ minutes
4	8½ feet	4 inches	4½ minutes
5	10½ feet	4 inches	5½ minutes
6	12½ feet	4 inches	6½ minutes
7	About 15 or 16 feet		

It will be noticed that the amount of ribbon used increases regularly for each tint up to No. 6. After the first tint has been reached by burning two and one-half feet of ribbon, it then merely requires an additional two feet for each further tint desired. This does away with all but the smallest amount of experiment and will often enable the worker to dispense with the use of any actinometer. All that is necessary is to ascertain by experiment the exposure required by a standard negative, preferably a thin one, and then, by comparison of any other negative with this standard, to estimate the amount of ribbon required.

The printing is done by burning the required length of ribbon, suspended over a metal tray, at the given distance from the printing-frame containing the negative and carbon tissue. It will often be found convenient to expose three or four pieces of tissue at a time by arranging as many printing-frames in a triangle or square, standing them on their edges and allowing the ribbon to hang down in the center. With frames larger than 6½ x 8½ in size, this method will drive the burning ribbon a greater distance from the negatives than the table allows for, viz: four inches, and due allowance must be made for this in printing from large negatives. Mr. James states that this method has proved completely successful in his experience.

Defects and Failures

The following exhaustive summary of defects and remedies in carbon printing was prepared by Mr. H. W. Bennett, and may well conclude our account of the process. **Storage of Tissue** ; When sensitive tissue cannot be used

as soon as received, it must be protected from the action of the atmosphere as well as light. Wrapping in waterproof paper and storing in a printing-frame under pressure will fulfil all requirements for two or three days. If not so preserved the tissue rapidly becomes insoluble. For longer keeping a receptacle containing dry chloride of calcium may be used. This preserves the solubility of the tissue for a long time, but makes the tissue brittle, so that it requires handling with care, as it is difficult to avoid cracking the film. If this method of storage is adopted, the tissue should be exposed to the air in a dark cupboard or drawer for an hour at least before printing. **Preparing Tissue for Printing:** To prevent the attraction of dust and other small particles, the tissue should be dusted with a soft fabric before placing in contact with the negative. **Safe Edge:** The tissue should be placed so that it does not project beyond the projecting safe edge. It must be covered on all sides to the extent of one eighth of an inch, at the least, by the safe edge or frilling in development will occur. **Printing:** The same brand of silver paper must be used for the actinometer by which the depth of printing is gauged or uniform results cannot be obtained.

The Image Is Too Light: This is principally caused by under-printing. If the exposure has been carefully gauged and the correct exposure for that negative is known, the weakness of the image may be caused by want of sensitiveness in the tissue. The result may arise from the over-development of a correctly exposed print or from commencing development with water at too high a temperature. One hundred and five degrees may be considered the standard temperature. **The Image Is Too Dark:** This is mainly due to over-printing but may be the result of variations in the sensitiveness of the tissue. **Age of Tissue:** The tissue may have been kept too long and become partially insoluble in consequence. Or the prints may have been kept too long after exposure without means being taken to arrest the continuing action of light, which goes on after the print is taken from the frame. This continuing action may be largely checked by keeping the print under moderate pressure, or entirely stopped by storing the print in a

calcium tube or box. **Non-adhesion of Tissue**: The printed tissue may fail to adhere to the single-transfer paper. The transfer paper may not have been soaked long enough. A thin paper will not require more than four or five minutes. A thick and rough paper should remain in water twenty or thirty minutes. The print may have been soaked in water too long before squeegeeing into contact. Dry tissue will curl with the sensitive side inwards on being placed in cold water. As it becomes impregnated with water it straightens out and finally curls with the sensitive face outward. It should be taken from the water and squeegeed into contact before it becomes quite flat. If the soaking is allowed to proceed too far, this curling tendency will be sufficiently strong to cause it to leave the transfer paper. The want of adhesion due to these two causes is evident at the time of squeegeeing the prints to the transfer paper.

Insolubility of the Tissue: When the tissue has become insoluble through long keeping after sensitizing, it frequently peels away from the transfer paper, partially or entirely, when an attempt is made to remove the backing-paper. **Insufficient Water**: Between the tissue and transfer paper when squeegeeing into contact may result in imperfect adhesion. **Air-Bubbles**: These, on the tissue when soaked in water previously to squeegeeing it to the transfer paper will produce patches of imperfect contact and consequently fail to adhere. If allowed to remain on the transfer paper in the preliminary soaking, they will lead to a similar result. **Blisters**: These, during development, are the result of imperfect adhesion and are frequently due to the causes just given. **Frilling**: Another example of the defect, which is frequently caused by the edges of the print not being protected by a safe edge. Very hot water or prolonged development may either cause or aggravate the defects of blisters and frilling. **Non-adhesion of Printed Tissue to Temporary Support**: This may be due to the following causes in addition to those relating to single-transfer paper. Insufficient waxing solution applied to the temporary support, or polishing and rubbing off too much of the solution. The surface of the temporary support should

be rubbed carefully with a piece of soft, fluffless fabric, after applying the solution. This should be sufficient to render the coating uniform. The support should be left with a slight surface moisture. Using the temporary support too soon after waxing is a certain cause of failures. One hour at the very least should elapse if the support is hung in a dry and warm room. With careful storage, the supports may be kept indefinitely after waxing.

Backing Paper Difficult to Remove: This may arise from insolubility of the tissue, to excessive over-printing, or to removing the backing-paper too soon after placing the print in the hot water. When this difficulty is experienced, the print should be allowed to remain a few seconds longer and another attempt made from a different corner. **Streaks and Markings:** These may appear on the surface of the print as soon as the image is visible. They are mostly caused by not keeping the print completely submerged during the removal of the backing-paper, or making long pauses during that operation. **Circular or Irregular Patches:** These, if lighter, than the surrounding work and having a dark margin, occur in the lighter tones of the picture in the early stages of development, and are due to leaving the print too long before stripping off the backing-paper. They frequently disappear during the progress of development. The backing-paper should be removed as soon as possible after placing in the hot water. **Light Streaks, Markings or Patches:** These may arise during development or in the alum bath. They are frequently caused by allowing the surface of the print to come into contact with other prints, the fingers, or any solid substance. The film is very delicate, and nothing must be allowed to touch it until after drying. When rewetted for double transfer or for mounting, it may be touched without injury. **Defects in Drying on Temporary Support:** At this stage the film may leave the temporary support. This is caused by drying too rapidly or in a place that is too warm. A cool place and slow drying are desirable. **Film does not Adhere to Final Support in Double Transfer:** The final support or the temporary support bearing the print may not have been soaked sufficiently in cold water. At least fifteen minutes should be

allowed so that the gelatine may absorb water fully. The final support may not have been immersed in warm water. It may have been immersed too long or the water may have been too hot. Immersion in warm water is necessary after the long soaking in cold in order to soften the gelatine coating sufficiently to enable it to adapt itself to the relief of the image, and also to cause it to adhere. The water must be about 90° Fahr. The final support should be immersed for a few seconds only, just until the gelatine becomes soft and yielding. If left soaking too long or in water that is too warm, part of the gelatine coating dissolves away and insufficient remains to form a bedding for the image. The gelatine should be in a semi-soluble condition when the transfer is made.

Double Transfer: In working double transfer on drawing-paper the failure to adhere may arise from the paper intended for the final support having received too thin a coating of gelatine. From 26 to 30 ounces of a one-in-thirty solution of gelatine should be used for six imperial sheets of drawing paper. This should be applied in three or four coatings. The image will also fail to adhere to the final support if too little gelatine is used in making the transfer. **Film Failing to Leave Temporary Support:** This is due to insufficiently waxing the temporary support. **Non-sensitized Carbon Tissue:** The unsensitized tissue will deteriorate if allowed to become damp. It will keep indefinitely in a dry and cool place. **Sensitizing and Drying:** To secure uniform sensitiveness the strength and temperature of the sensitizing bath and the time of immersion should be as uniform as possible. The sensitizing bath should always be alkaline: an acid solution produces partial insolubility of the tissue. In drying tissue after sensitizing, if it is allowed to remain on a ferrotype plate, a little of the sensitizing solution must be left between the tissue and the plate before squeegeeing. If the tissue is drained before squeegeeing and there is no liquid between its face and that of the plate, it will fail to strip after drying. Drying at too high a temperature after sensitizing will spoil the working qualities of the tissue. Spots or patches of uneven sensitiveness are caused by air-

bubbles forming either on the back or the face of the tissue. They should be removed immediately after immersion.

Ozobrome The modification of carbon printing known as ozobrome deserves mention here. As the reader knows, an ordinary carbon print consists of pigment in gelatine, obtained by printing through the negative on to sensitized tissue and subsequent development. Ozobrome gives a similar result by less direct but simpler means. The sensitized pigmented tissue is squeegeed face down on a bromide or velox print upon which it deposits the carbon pigment. Then, the silver of the bromide print being removed, an image in pure carbon pigment remains on the paper. An alternative process is to strip the carbon tissue from the bromide print and transfer it to some other suitable surface. By this process any number of carbon prints can be made from the bromide print: the image on the latter being redeveloped each time. The number of carbon prints that can be obtained in this way depends upon the power of the bromide print or enlargement to resist the action of the various baths. Now, as bromide enlarging is quite a simple process, it is obvious that the production of large carbon prints from small negatives becomes easy.

It will thus be seen that carbon printing by the ozobrome process places the worker in possession of many valuable advantages. He can print without light as no exposure of the tissue is necessary. Then, bromide or developing paper, the first sensitive surface to be used, is everywhere available in several grades, so that no sensitizing operation is required. Moreover, enlarged negatives for carbon enlargements are not needed, as, in place of them bromide enlargements on paper are used. The image not being reversed double transfer is not necessary. To end up this brief list of the principal advantages of ozobrome: printing from a negative is quite dispensed with, and, as any kind of negative can be used for making the bromide print or the enlargement, the different grades of bromide and developing-out papers make it easy to produce soft or contrasty ozobrome prints at will.

The working instructions for ozobrome printing were given in No. 81 of THE PHOTO-MINIATURE (September, 1907). We need not, therefore, repeat them. Since the date mentioned the materials required for the process have been placed on the market by the Eastman Kodak Company. Given the production of the bromide print or enlargement, no special apparatus beyond a thermometer and hot water are required. The tissue is supplied in the following colors: engraving-black, warm black, blue-black, sepia, warm sepia, portrait-brown, vandyke-brown, red chalk, terra-cotta, marine-blue, sea-green, Italian green. A sensitizing powder is requisite; this also is supplied; and finally, seven kinds of transfer paper: (*a*) fine white, smooth; (*b*) medium grain matt; (*c*) white etching; (*d*) toned etching; (*e*) stout drawing medium. The tissues and the transfer papers are issued in cut sheets and rolls.

Carbograph

Modified carbon printing also finds expression in a new process called carbograph, which was introduced by the Rotary Photographic Company, of London, in November, 1907. Here the end aimed at is the direct production of carbon enlargements or contact prints by exposure to artificial light and subsequent development. The carbograph process is briefly as follows: The paper bears a coating of carbon pigment and silver bromide in gelatine. After exposure to artificial light either in contact with a negative, or in the enlarging lantern, a ferrous oxalate or iron citrate solution is used to develop an image of metallic silver in the paper. The print is next cleared in acetic acid, washed, and then sensitized in a solution of potassium bichromate and alum. This solution hardens or renders insoluble the gelatine film in direct proportion to the amount of silver reduced in it. The sensitized silver-pigment print is then transferred to a suitable support, and the soluble gelatine developed away, as in ordinary carbon work. It is now necessary to fix out the unaltered silver bromide which remains in the film: this is done in a solution of hypo. After washing, the prints will still contain metallic silver. To remove this, a reducing solution of hypo and potassium ferrocyanide is recom-

mended. Then an impression in pure carbon will be left. Failing the removal of the silver, the image is a compound of metallic silver and carbon pigment. Alternatively, the original developed image may be reduced out of the film before the latter is sensitized in a modified bichromate-alum bath. The print is next fixed, washed, dried, transferred to its support and developed as in ordinary carbon work. Carbograph may still be regarded as in its probationary stages, as regards the public use of it; but it may be pointed out that it is by no means novel, as we can clearly trace its origin to a suggestion of the late Leon Warneke which was published in the year 1881. Moreover, we take leave to question the permanency of a process which in its result is a compound of deposited silver and pigment unless the intermediate operations have been very carefully conducted.

Leto Pigment Paper

This new pigment paper deserves mention here as combining the simplicity of the carbon method with the adaptiveness for pictorial effects peculiar to the gum-bichromate process. It is imported by J. L. Lewis, New York, and consists of paper coated with very thin pigmented gelatine. Sensitizing is done with a brush, a spirit sensitizer being employed, and the paper dries in ten to fifteen minutes. Leto pigment is about twice as sensitive as print-out paper and printing in the shade is advised, the use of an actinometer being necessary. Development and clearing are effected as in carbon printing, the use of brushes of different sorts and sizes permitting of a wide range of modification in development.

BOOKS

Carbon Printing. By E. J. Wall. 104 pp., with a carbon print. 5th edition. 1900. (Eng.) 50 cents.

Carbon Printing. By W. Weston. 64 pp. 1896. 75 cents. This relates to the working of Elliott's tissues.

Carbon Printing. By Max Bölte. 32 pp. 2nd edition. 1893. 50 cents. A full and practical manual.

Carbon Photography Made Easy. By Thos. Illingworth. 154 pp. 1903.

Notes and Comment

*** The title page, contents and index for Volume VII of "THE PHOTO-MINIATURE," Nos. 73 to 84, inclusive, are now ready and may be had on application, accompanied by two cents in stamps.

The dream of today is the reality of tomorrow. A European university has instituted a Professorship of Photography. Lecturing in the Acland Museum of Oxford University in the year 1901, one of the present editors of THE PHOTO-MINIATURE pleaded for the elevation of photography to the dignity of a Professorate. Every day sees some new step made toward the rescue of a practical photography from mere rule-of-thumb and empirical methods; and it is good to know that educational authorities are recognizing that it may be taught in terms of scientific exactitude.

The Kodak Company, of London, has recently held at Bombay an exhibition of photographs which was described by the local press as probably the finest collection of the kind yet seen in India. The company is manifesting great activity in India at the present time, the business there being organized by Hedley M. Smith, formerly manager of the Paris branch of the company. The Indian amateur should especially welcome the opportunity of working with the Kodak Tank Developer.

The Progress Medal of the Royal Photographic Society has, we learn, been awarded to J. Sterry, for his photo-chemical investigations and for researches and

writings on sensitometry and on the action of substances on the latent image. Sterry was one of the first to appreciate and popularize the work of Hurter and Driffield. Besides his experimental work, he has done much writing and is the author of a popular book, "Photography by Rule."

The Annual Convention of the Professional Photographers' Society of New York will be held on March 31, April 1 and 2 next, in the building of the Metropolitan Life Insurance Company. The President of the year is A. F. Bradley. A fifty-dollar gold prize; studio demonstrations; lectures and demonstrations of the Autochrome process, and the annual dinner will be features of the proceedings.

Amateur and professional photographers should welcome the convenience of being able to procure a set of spotting colors for negatives, transparencies and prints. The Devoe Set issued by the Devoe and Raynolds Co., Fulton and William streets, New York will be found to serve the purpose admirably. There are five spotting colors in a japanned tin box 2 by 8 inches with two brushes, and the price is 50 cents, mailed free.

Two additions to the resources of the film photographer have recently been made: The "Barnet" roll films being obtainable from J. L. Lewis, 379 Sixth avenue, New York: and the Ensign films from G. Gennert, 24-26 East 13th street, New York.

Our readers will be interested in knowing that plates and materials for the Autochrome process are now obtainable from the American house of the Lumière Company, at 11 West 27th street, New York. A recent issue of *The Century Magazine* contained some three-color reproductions of Lumière Autochromes, the first, we believe, to be published in this country. A writer

in "The Amateur Photographer" allows himself to characterize the frontispiece as a "picture of a green globe and a shock-headed man who is apparently in the act of concealing a copy of *Camera Work*," and adds that this "must make the brilliant and imperious photographic Mahdi whom it represents (Alfred Stieglitz) doubt the impeccability of Mr. Steicher's impressions." But why "Mahdi?"

The Wager Exposure Scale and the Wager definition scale are now manufactured by Burke and James, 118-132, West Jackson Boulevard, Chicago. As our readers know, the first of these is a neat and popular form of exposure meter; the second a tabular guide to the exposures required on moving objects.

In our next issue we hope to find room for an interesting paragraph on a lot of desirable mounting papers recently introduced by the Mittineague Paper Company, of Mittineague, Mass. This well-known firm has an enviable reputation in the world of high-class cover, writing and book papers, and its entry into the photographic field is an event which promises much for those who appreciate the value and importance of the mount as a setting for the photograph.

Penrose's Pictorial Annual, 1907-8: The Process Year Book. Edited by William Gamble. 185 pp.; illustrated; $2.50. Tennant & Ward, New York, American agents. To the process worker Mr. William Gamble's beautiful book has become an annual necessity. In the issue before us there are 270 illustrations, many of them in color and over sixty articles by authorities on process matters. "Color photography" supplies the subject of many of those articles, the Warner-Powrie process coming in for reference. Amongst the illustrations is a three-color reproduction of an Autochrome. Collotypes; photolithos; two- and three-color prints; many line and halftone pictures are amongst the superb gallery of illustra-

tions which "Penrose" serves up in this annual feast for the eye. We heartily commend this beautiful and useful book.

In *Photograms of the Year 1907*, the work of the Editor, Mr. H. Snowden Ward, manifests itself more prominently than hitherto. A. C. R. Carter, the successor to Gleeson White, the book's first critic-in-chief, having retired from the position, Mr. Ward himself properly steps into the vacancy without diminishing the authority or value of the volume one jot. Indeed, we look upon the change as distinctly to be approbated, for photography has too long had to suffer under the patronage of back-pattings of superior critics from the picture-galleries and the dry-as-dust reviews. As a record of progress in pictorial photography and a well-judged series of critiques, the book before us is of the highest value. We do not say that it should form part of every photographer's library; but it deserves to, which is better. It is obtainable of Tennant & Ward, New York. Paper covers, $1; cloth, $1.50.

Errata in THE PHOTO-MINIATURE No. 84. The reader is advised to correct the types in The Photo-Miniature to read as follows: page 569, seventeenth line from foot of page—sodium *carbonate* 240 grains; page 571, twenty minutes development formula, add to Solution C—water 16 ounces; page 579, second column from right at foot read 15 instead of 14; page 583, second column from right at foot read 11 instead of 21.

Books and Prints

All books noticed in these pages may be obtained from the publishers of THE PHOTO-MINIATURE, and will be promptly forwarded, postpaid, to any address on receipt of the publishers' prices as here quoted.

The 1908 U. S. edition of the Burroughs Wellcome *Diary and Exposure Record* is now ready, price, 50 cents. *Real Colour Photography*, by R. Child Bayley, a practical résumé of Autochrome color work, is also on sale, price, 50 cents.

Flashlight Photography Made Easy, an illustrated book which forms a succinct guide to the subject, has been published and is to be had free on application to the Luxo Company, 1226 Arch street, Philadelphia.

Fallowfield's Photographic Annual, 1907–8. This volume of nearly 1,100 pages is the largest and most complete catalogue of photographic supplies that has come under our notice. It is published by Fallowfield, one of the oldest firms of dealers in the world, at 146 Charing Cross Road, London, W. C.

Titles for Photographs. Published from the offices of "Focus," London. Price 25 cents. A well-known English writer, Mr. A Lys Baldry, sent out, some time ago, a volume full of titles for photographers and printers, and it met, we believe, with quite a favorable reception at the hands of those whom it was designed to help. The compiler of this far less pretentious little book has catered simply for amateur photographers, who in their work seek to break away from the more

commonplace titles that inevitably occur to new recruits in picture-making. Poets and other writers have been drawn upon for inspiration, and the resultant book is a collection of telling lines applicable to a great variety of subjects.

Color Photography. By George E. Brown, F. I. C., and C. Welborne Piper, 16 pp. Price, 15 cents, Tennant and Ward, New York. This brochure is a short résumé of practical experiences with the Autochrome process.

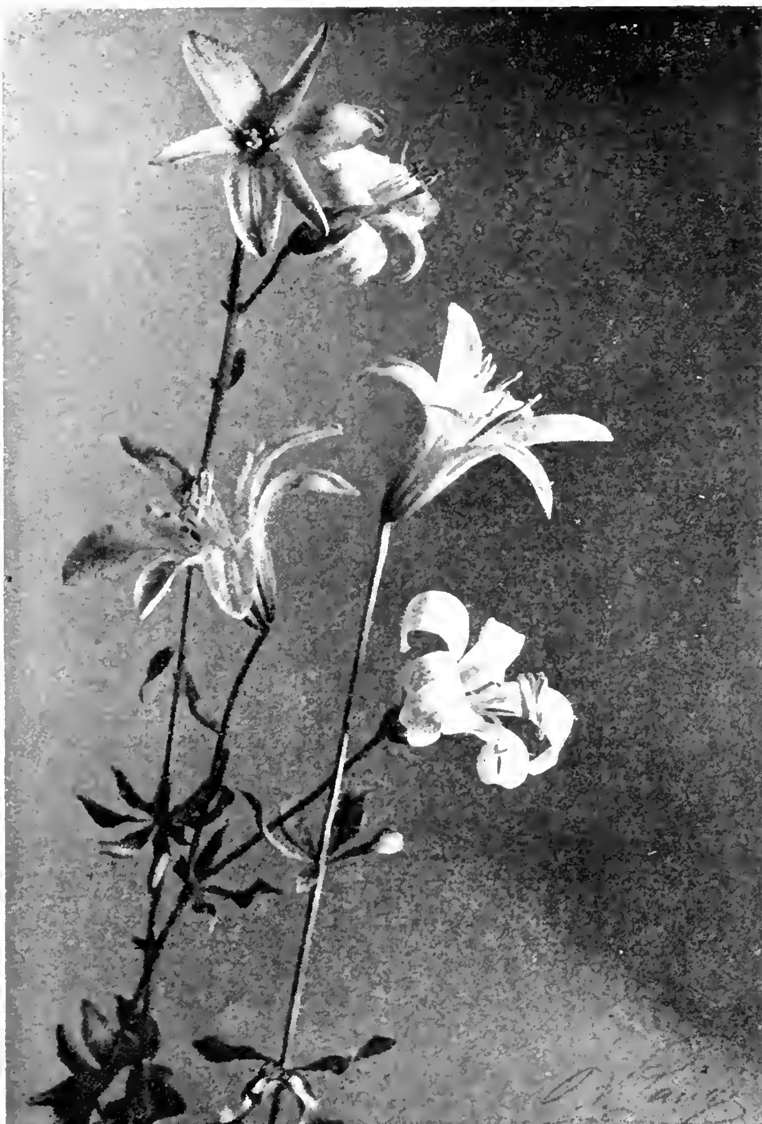
The focal plane shutter and the action photographs for which it is mainly used is the theme of a beautifully produced and instructive little book that has been sent us by the Folmer & Schwing Co., Rochester, N. Y. There are over 30 examples of high-speed work in the book, which sells at 25 cents, and much valuable data regarding the practical applications of the focal plane shutter. With this book for a guide, the photographer should not fail in very rapid exposures on moving objects. It cleverly condenses the whole teaching of the subject; and should be carefully studied by the would-be recorder of the rapid motion of animate and inanimate objects.

The Kodak Baby-Book, issued by the Eastman Kodak Company, Rochester, N. Y., is a prettily illustrated book on child portraiture at home. The pictures and letterpress are the work of Mr. C. H. Claudy. Copies are obtainable of any Kodak dealer.

Many notes are again held over by the pressure upon our space.

The Pose
Copyright, 1907 by J. Arthur H. Hatt

The Last Stand
J. M Whitehead



Lilium Washingtonia
O. V. Lange

The Mojave Desert Poppy
O. V. Lange

The Photo-Miniature
A Magazine of Photographic Information
EDITED BY JOHN A. TENNANT
AND THOMAS BEDDING, F. R. P. S.

Volume VIII March, 1908 Number 87

Bromide Enlarging Made Easy

The greater number of enlarged photographs now produced are made by the "bromide" process. Like many other terms used in photography, this one is a misnomer. "Bromide enlargements," or "enlarged bromides," strictly speaking, are misapplied descriptions. The finished picture is an enlarged image in metallic silver, made by exposing a negative to paper coated with silver bromide in gelatine, and subsequent development and fixation. "Bromide," therefore, forms no part of the final result, which like our ideal negative should be, to quote Chapman Jones, an image of pure silver in clean gelatine. It is too late to abolish the term "bromide," which is perhaps clear enough for the purpose, and so, for convenience' sake, we will adhere to it in these pages. Why is bromide enlarging so popular? Simply because the process is easy, the effects beautiful, and the results permanent. It is, also, the least expensive of all enlarging processes; the pictures can be made in large numbers with almost mechanical certainty, and the tone or color of the final image varied at will. All this should dispose the great army of small workers, for whom this number of THE PHOTO-MINIATURE is chiefly written, to regard the bromide enlarging process as an ideal one for their purpose, whether that purpose be pictorial or technical, or inspired by any other photographic ambition.

In practice, the worker, if he choses, can dispense with daylight in making the exposures for the enlargements; on the other hand he can use it exclusively. The additional apparatus required can be entirely home-made, or if it be bought, almost any pocket is accommodated by the variety on the market, as the owner of a Brownie may procure an enlarging attachment for it to make pictures six and a half inches square, at a cost of three or four dollars, whilst complete outfits for the work by artificial-light projection are to be had for moderate sums. But in any case, the ease and simplicity of the process itself are unaffected.

Contact Printing

The first step in practical bromide enlarging work is to gain a knowledge of the paper itself. This is best done by a short preliminary course of contact printing, that is, by exposing the paper to light behind a negative in an ordinary printing-frame and then developing the impression. We will suppose the reader to have a dark-room already equipped for negative work; a suitable negative, that is, one in which the scale of gradation from high-lights to deep shadows is in its proper order; and a packet of bromide paper. Place a sheet of the paper in contact with the negative, film side to film side, in the frame; clamp down the latter and make ready for the exposure. Roughly, bromide paper is about $\frac{1}{20}$ the rapidity of a very quick plate or film. Our own experiences here may serve to guide the reader. A momentary exposure to diffused daylight; one second at a foot's distance from a gas jet; five to an ordinary kerosene lamp; ten to a candle at the same distance, are exposures that we have given in actual work, as tentative experiments to arrive at a standardized plan of making the exposures in contact printing. The exposure having been made according to one of the methods just given, we come to the development of the picture. This operation, if the exposure has been properly timed, will teach us many valuable lessons. First of all, we must point out that the working light of the dark-room need not be of that very deep red or yellow which is so often used for developing rapid plates or films. Bromide paper is far less sensitive than these, so that a yellow light, and

plenty of it, will answer the purpose. It will be found that the paper may be developed within two or three feet of such a light without fogging the picture. The readiest way of testing the safety of the light is by exposing a piece of sensitive bromide paper to it at a distance of a couple of feet for two or three minutes and then placing it in a developing solution. If no visible fog results it may be assumed that the dark-room light is safe; if fog is developed, then the yellow glass passes too much actinic light and it must either be rendered less powerful by suitable means, or the picture developed at a greater distance from it. Before development, place the exposed paper in a clean dish and flood it with plain water. This will prevent the paper from curling up and softens the film, so rendering the image more easily attacked by the developer. Next pour off the water and apply the developing solution with a steady, even flow. Make the developer according to this formula (Yellott's): Take 1½ ounces of a 25 per cent solution of sodium sulphite; amidol, 30 grains; 5 to 10 drops of a 10 per cent solution of potassium bromide, and dilute for use with 4½ ounces of water. Pour this solution steadily and evenly over the paper from its lower edge, rock the tray gently from left to right, so as to keep the solution in motion and in a few seconds the always beautiful phenomenon of the growth of the image will be seen: the shadows, the half-tones, the delicate details and all the intermediate gradations of the positive coming out to form the completed photograph. As soon as the picture has reached its proper depth pour off the developer into the graduate; wash the picture in several changes of water; and then fix out the unaltered silver bromide, i. e., that which has not been acted upon by light, in a clean solution of sodium hyposulphite, 3 ounces; water, 16 ounces. Fixation will be complete in fifteen minutes. Then the print is well washed in running water for twenty minutes, or soaked for an equal period in several changes, and finally placed aside to dry spontaneously. The resulting print, when dry, should be of a rich black color, pure in the lights and without trace of stain or discoloration. We have had our first, and it is to be hoped, successful lesson in bromide enlarging

work. The making of pictures of larger size by one of several methods is now to occupy our attention.

Choice of Paper

The choice of an enlarging paper rests upon the kind of picture the reader intends to make. The number of papers at his disposal will meet all ordinary needs. Two principal varieties or grades are issued by the manufacturers; viz: *hard*, for prints showing strong contrasts from overexposed and underdeveloped negatives, and *soft*, for use with contrasty negatives in making soft prints or from dense negatives without shadow detail. These two classes of papers are subdivided off as follows: (1) Thin and thick glossy papers used for commercial work and small contact printing. Among these will be found *Eastman Enameled Bromide* and *Monox Gloss*. (2) Thin and heavy papers with a semi-dull surface, the thin for contacts up to 6½ x 8½; the heavier for larger prints and black and white enlargements. The *Eastman Standard Bromide* and *Monox Lustre* come under this head. (3) Semi-rough or half-matt papers with surfaces varying from egg-shell finish to slightly rough drawing paper. In this series, the most widely used are *Eastman Platino-bromide; Monox Matte;* and on the English market, *Wellington Rough, Cream Crayon* and *Special Thick; Ilford Matt Surface; Barnet Platino-Matt* and *Lustra Matt*. (4) Rough papers with a variety of surface finish and tint, and intended for use in making prints with the now very popular broad effects, such as the *Eastman Royal Bromide; Monox Rough and Buff; Ilford Bromona;* the *Wellington Extra-Rough;* and the *Barnet Tiger Tongue*. These latter papers are often used for making unmounted prints of an artistic character. In the matter of papers for enlarging purposes the worker is well catered for in respect of weight, texture, color and surface finish, thus making it a thing of the utmost simplicity to gratify his individual taste.

The Negative

Upon the character of the negative depends our measure of success in making the enlargement. Too much importance cannot be attached to this matter. Some authorities claim that negatives inclining to thinness make the best enlargements. This advice is of doubtful value.

Generally speaking, a fairly strong negative, that is, one with neither excessive contrast, nor excessive flatness; one that has been fully exposed and developed to good density in the shadows—is the most suitable for our purpose. Such a negative will give a print in sunlight on printing-out paper in three or four minutes. The image of the negative should be sharp and well defined and the deposit free from coarseness and granularity. It should have no surface or mechanical defects, and be without fog, specks, or other markings If it is thin, it must be intensified; if over dense, reduced. It is best, of course, to make, at the outset, a negative which needs no after treatment to fit it for enlargement.

Film Negatives

Most of the negatives selected for enlargement today are made on roll films. Such a film, when placed in the negative kit of any enlarging apparatus using artificial light, will curl and twist in a troublesome way. To prevent this, prepare the negative as follows: Take two pieces of clean glass, free from air-bubbles, scratches or other defects, and slightly larger than the film negative in use. Bind these together at one side, forming a hinge, with a piece of passepartout binding or strip of paper or linen with LePage's liquid glue. Insert the film negative in this transparent enclosure and bind the top edges together with an india-rubber band. It is now ready for use in the enlarger. (See Fig. 1).

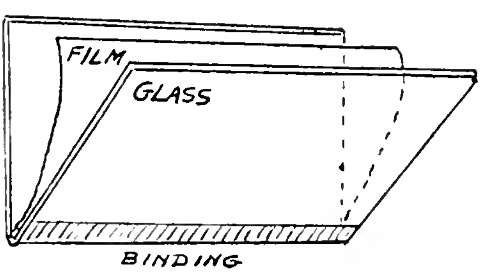


FIG. 1.

Principles of Enlarging

The principles of enlarging are easy to understand. When we make a bromide enlargement what we do is to rephotograph the original subject on a greater scale than at first, using the negative instead of the original for the purpose. This is all there is in the process, however complex it may seem on casual reflection. If we could substitute a finished negative for the ground glass of a camera and

at the same time could place a sufficiently large sheet of white paper at the point focused on when we took the negative, the paper would receive upon its surface a negative image as large as the view itself. But if instead of plain paper we set up a sheet of sensitive bromide paper and protected it from all white light except that which came through the lens, we should get on development an enlarged image from the negative in the form of a positive representation of the original. Therefore, in attacking the practical side of the work we have to devise means for properly illuminating the negative; shielding the sensitive paper from all white light that does not come through the lens; keep the negative and paper parallel to each other; use suitable apparatus for these purposes and develop the results in a dark-room. Bromide enlarging presents no greater difficulties than these, and it is the purpose of this monograph to show that the whole process is delightfully simple when it comes to reducing it down to practice. First, as to the light and the method of its control.

The Condensing System

Let us suppose the light for illuminating the negative to be a point, and follow the paths of the luminous rays as they leave that point. Most of them go straight on to the negative and pass through it, but others diverge, escape outside the negative and, being lost or scattered, take no part in forming the image. Now in order to prevent these rays from escaping into space and concentrate them upon the negative, we use lenses to condense them, by gathering them up as they leave the luminous point, to pass them through the negative and converge them at the projection or enlarging lens, which carries them on to form a magnified image of the negative on the sensitive surface. The condensers commonly employed are two in number, each of plano-convex form and placed in a circular metal cell so that their convex sides are turned towards each other. They are properly made of colorless glass, free from striæ, internal flaws, air-bubbles and surface markings—otherwise the light would be diminished and the enlarged image degraded wholly or in part. Their size is decided by a simple rule. Their diameter should exceed the diagonal of the negative to be enlarged, so

that the whole of the picture is included within the circumference of the cone of light which it is the primary function of the condensers to form. For a quarter-plate negative, condensers of five and one-half inches diameter should be used.

Supposing no condensers were used in illuminating our negative from the luminous point, it is now, of course, obvious what would happen. The image on the easel or screen would only show that part of the negative actually in front of the light, because the effective intensity of this light depends upon the quantity of it which the condenser first collects and finally converges into the enlarging lens. If the place of the condenser were taken by a sheet of ground glass the negative would, of course, be well and evenly illuminated, but the glass would not collect all, or at any rate, sufficient of the light from the luminous point, whilst of the light passed through the negative practically none of it would be converged into the projection lens to form the image. Hence we see that the condenser actually performs the functions of a lens. Like other lenses, it has definite foci, and, in the artificial-light system of enlarging, has a right and proper position, which must be carefully kept, if the optical part of the work is to have its correct adjustment. The position of the illuminant and the condensers is readily ascertained by experiment. The back focus of a pair of 5-inch condensers is about three inches; putting it roughly, the point of light should be approximately that distance behind the condensers in order that a perfect cone of rays may be bent through the negative and converge on to the enlarging lens. If the light and condensers are too near each other, a dark patch will be seen near the center of the enlargement; if too far back, the margin of the picture will have colored fringes. In the former case there is also risk of the heat fracturing the glass, especially if the condensers are not mounted loosely in the cell. It comes to this in practice, that the correct position for the condensers is at a point axially to the light where the rays evenly illuminate the negative and converge in the projection lens. That point is approximately at a distance equal to the back focus of the pair of condensers.

The foci of single plano-convex condensers are usually as follows:

Diameter		Focus	
4	inches	5½ or 6½	inches
4⅛	"	5½ or 6½	"
4½	"	5½ or 6½	"
5	"	6	"
5½	"	8	"
6	"	10	"
6½	"	10	"
7	"	12	"
8	"	12	"
9	"	14	"
10	"	15	"
12	"	18	"
14	"	21	"

When two single condensers are combined, the focus of the combination is half that of the single elements: thus the focus of a pair of 6-inch plano-convex condensers would be three inches, measured from the center of the combination. A sheet of ground glass between the condensers or between the latter and the light aids the better diffusion of the light, but it is a refinement in actual work, which it is not at all vital.

Triple condensing systems are sometimes used in enlarging lanterns. A meniscus lens is added to the two plano-convex lenses in a position nearer to the light than the latter. This system collects a larger angle of light than the ordinary condenser; the rays are more easily parallelized and there are other minor advantages.

Mounting Condensers

Pairs of condensers, mounted or unmounted, can be bought at the following prices:

Diameter in inches	Focus in inches	Pair of Lenses Mounted	Per Single Lens unmounted
4	5½ or 6½	$4 00	$1 25
4½	5½ or 6½	6 00	1 50
5	6½	7 50	1 75
6	8	12 00	3 00
8	12	32 00	7 50
9	14	40 00	10 00

To mount them, if the worker is so inclined and has the necessary mechanical skill, proceed as follows: Cut a piece of ¼-inch pine or poplar to a square about an inch larger than the diameter of the lenses. In the center of this saw out a circular opening the exact size of the lens. In another board, of the same dimensions, cut a circle a quarter inch less in diameter. Place these boards together with the grain running in opposite directions, to prevent warping, and keep the lens in position by a wire bent in a circle and clamped in place so as to hold the lens, or other similar arrangement. Mount the other lens in the same way. The two are mounted together with their convex sides facing each other and a slight distance apart. A sheet of finely ground glass placed between them overcomes any slight flaws in the lenses. The combination is then boxed up.

Illuminants

The variety of illuminants that may be used in bromide enlarging is considerable. First, we have oil or kerosene, the commonest and handiest form of light for the purpose, but of comparatively low illuminating power. If the lamp has double or triple wicks placed edgeways to the condenser, the light approximates more to the theoretical point, which it should be, and a bright, steady, even light of practical utility is obtained. Coal gas—common house gas—offers too large a flame for the purpose and is not of sufficiently high illuminating power, but if it is burned in an incandescent mantle then we have an ideal illuminant of great intensity for a negative of average density to be enlarged up to a moderate degree of amplification, say two to six diameters or linear magnifications. Acetylene is theoretically a good light for enlarging. It is necessary that the gas should be evolved from calcium carbide in a generator, but it gives a small and singularly brilliant flame in the shape of a point, and is penetrating as well as brilliant. Where an acetylene burner is of triple form, that is, the three burners each having two tips, are set obliquely and at different heights, as in the Ingento, a light of great concentration and power is obtained. Acetylene generators are comparatively inexpensive and the light is only inferior to limelight and electricity in actinic

value. Limelight, with a mixed jet, gives an excellent light for the purpose and, where available, is to be recommended. Many photographers use the light for optical projection work and so may easily adapt it for their enlarging purposes. The great intensity of the illuminant necessitates the employment of negatives not too thin in character. Finally, as to the electric light, which, in the arc form, answers admirably as an enlarging illuminant. Some authorities recommend the incandescent bulb, such as the 100 candle-power stereopticon lamp, voltage 100 to 125 with cylindrical spiral attachment. Used with a parabolic reflector, this gives a brilliant white light, closely approximating the ideal point required. The life of these high-power lamps is, however, comparatively short. The electric arc gives off a great deal of heat. Like the limelight, its intensity and great penetrating power make the use of strong negatives necessary.

Lenses

The lens that takes the photograph will also enlarge it. What is required is that it shall be of a sufficiently wide angle to cover the negative to be enlarged; have equality of illumination, a flat field and freedom from distortion. The focal length of the lens is a factor of importance. The longer the focus of the lens used for enlarging the better will be the result, because with a lens of too short focus it is difficult to get evenness of illumination, the lens being placed too near the negative. It should have a focal length of at least the longest diameter, or the diagonal, of the negative it is used to enlarge from. Thus for a quarter plate a focal length of six, seven, or even eight inches may be advantageously employed; compare lenses of four-inch or five-inch focus with the diagonal of the negative and it will be seen that the circle of even illumination which they cover is not sufficiently large in diameter to give satisfactory results. The form or type of lens best suited for the work is without doubt an anastigmat, because to great covering power it adds flatness of field and large working aperture, thus giving it the capacity of projecting a well-defined, evenly illuminated image of the negative on to a perfectly flat surface, i. e., the sensitive bromide paper, and shortening

the exposure. Next in order of excellence come lenses of the rectilinear type, whose open aperture is f/8. These for subjects such as architectural views, well-defined landscapes and technical photographs may require to be stopped down in use if perfect marginal definition is wanted, although on many subjects of an artistic or pictorial character where critical fineness of definition is not essential, the open aperture may safely be employed. Some workers possess portrait lenses. These have an intensity as high as f/3 or f/4 and so for enlarging portraits or single figures their rapidity is of practical value in shortening the exposure. For other work they are scarcely to be recommended as they are bulky to handle and need stopping down very much to render them fit for critical work over the whole of the field.

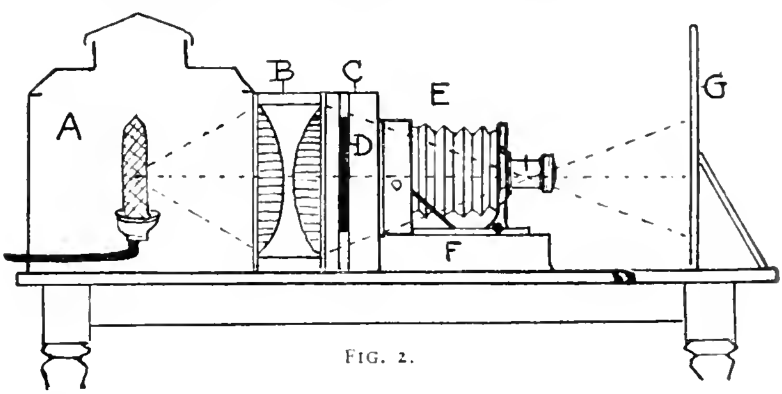


FIG. 2.

Having chosen our light, condensers, negative holder (this we assume to be in an artificial-light lantern), camera or lantern, enlarging lens and screen, the entire system is next arranged preferably on a stand or suitable table in the enlarging room. In the arrangement of the apparatus, the planes of the light, condensers, negative, projection lens and screen must be parallel; second, the centers of all should be in a straight line and third, the light or the condensers should be so mounted as to easily slide backward or forward, since each time the projection lens is racked forward or backward it necessitates a corresponding motion of the condensers to or from the light.

A simple artificial light enlarging outfit is shown in Fig. 2. In this diagram A is any convenient lantern or

light box holding an incandescent gas burner, oil lamp, or incandescent electric lamp or electric arc. B indicates the condensers. C the negative carrier. D is the negative in position. E is the camera. F a box elevating the camera to its proper height. G is the easel or drawing board fixed at the desired distance from the lens.

Enlarging Without Condensers

The four previous sections discuss the principles of enlarging and their application to an optical system in which it is assumed that light is a point and condensing lenses are necessary in order to concentrate all the available rays upon the negative, converge the cone of rays that come through the negative on to the objective or projecting lens, and throw an enlarged image on to the sensitive screen. The use of condensers is, however, not necessary in daylight enlarging systems, to which we allude in the following pages, and in one method by artificial light which we have found of great practical value. This is by the use of reflected light. To carry it into effect: Set up a reflecting surface of white paper—a board covered with the paper will do—and in front of it two lamps or other artificial illuminants of equal value, so as to evenly illuminate the white surface. A concave reflector of white cardboard or tin may be substituted for the plane surface. The negative being placed in the plate-holder of the camera receives its illumination from the light radiated from the white surface of the reflector. Means must be taken to shield the lens and the sensitive surface from the direct light emerging from the lamps. A variation of this plan is to place the plane reflector—which as already said may be any whitened surface—at an angle of 45° with one of the vertical edges of the negative-holder. A powerful lamp or few feet of burning magnesium should be used to illuminate the reflecting surface as brightly as possible, and from that surface the rays will pass through the negative and transmit an image to the screen. The point of this idea lies in the fact that condensers are not absolutely essential for securing even illumination of the negative in bromide enlarging work and that a little ingenuity on the part of the worker may easily provide efficient substitutes of a simple character. An enlarging

outfit in which no condensers are employed is shown in Fig. 3, as given by E. S. Thomas in *Photography*. In this outfit A is an aluminum reflector; B an ordinary incandescent lamp; C a tin tube 20 inches long, round at one end and fitted close to the reflectors, square at the other to fit closely to the wooden negative carrier D, which also holds a sheet of ground glass on the side next

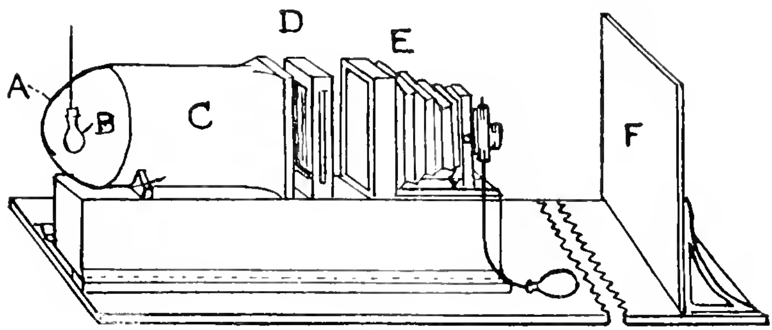


FIG 3.

to the light. E is an ordinary camera, and F the easel holding the bromide paper. But wherever obtainable we advise the reader to get one or other of the enlarging systems referred to in the next section. The luxury of working with suitable tools in photography is well worth indulging in and pays for the convenience it affords.

Simple Apparatus

The extra apparatus required in making enlargements on a small scale is both simple and cheap. Any idea to the contrary is easily dispelled by a glance at the various forms the worker has at call. To begin with, enlarging extensions are sold, which may be attached to the camera already in use, so that the exposing part of the work can be done in the open air or in an ordinary room. There are various types of this form of attachment. In one, the lens end of a kodak is inserted in the opening of a cone-shaped enlarger made of wood, the negative being placed in a holder at the other end. In the dark-room, a sheet of paper is laid at the bottom of the enlarger. After this has been replaced in position, the whole system is taken to the light and the exposure made to the sky for

the requisite length of time. Development takes place as usual. Another type is that of a light tapered box with space for the negative at one end; a fixed lens in the interior of the box, and a holder for the bromide paper at the other end. In these, and indeed in much more ambitious systems, the size of the enlargement is limited by the size of the bromide-paper holder. In a third type of this simple enlarger, the lens is movable instead of being "fixed focus." Such instruments may be purchased for comparatively small sums. Daylight enlarging cameras, for producing pictures from small negatives up to 10 x 12 or 12 x 15, and constructed on a much more elaborate scale than the simple instruments just described, are listed by all the principal dealers; and the reader

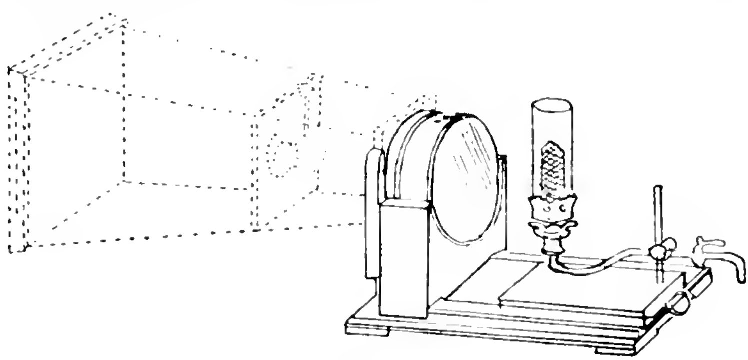


FIG. 4.

who contemplates purchasing one, is recommended to personally inspect the apparatus wherever possible. The use of a simple enlarger with artificial light and condenser is shown in Fig. 4, the enlarger being indicated by dotted lines. The use of the optical lantern for enlarging purposes is so popular that there are many excellent types of the instrument available. For example, Burke & James, Chicago, list two models. In one, the Russian iron light-chamber accommodates any artificial light; the lantern is fitted with condensers, negative-carrier, lens-board and every adjustable movement. The bellows has a long extension which admits of the use of projection lenses of different focal lengths. The same firm's Ideal Enlarging Lantern takes either gasoline incandescent vapor light, a Welsbach mantle burning ordinary gas, or a

kerosene lamp with a central-draft burner. It is designed on the well-known cantilever principle. A very popular type of lantern for enlarging by artificial light is the "Cantilever" made by Hume, of Edinburgh. Watson's, Houghton's and Lancaster's enlarging lanterns may also be mentioned for English readers. The Bright White Light Outfit of Williams, Brown & Earle, is cleverly designed for convenience and efficiency. A very wide selection of artificial-light apparatus may, therefore, be drawn upon; whilst, if the photographer is limited by the amount of money at his command, the simple daylight systems give the chance of making enlargements of

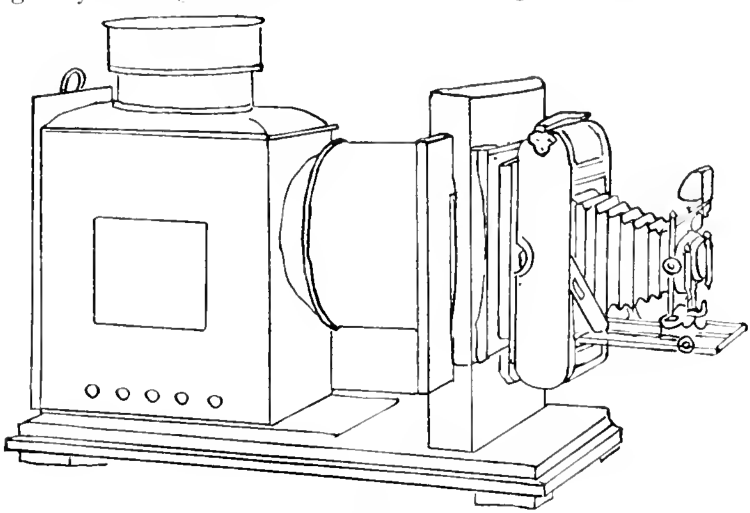


FIG. 5.

two or three diameters at a comparatively small cost. The construction of home-made apparatus is also a field to which he may turn. The adaptation of an enlarging lantern for enlarging purposes by the use of a special front fitted to take the back of a kodak is shown in Fig. 5.

Daylight Enlarging

Enlarging by daylight does away with the use of condensers, and if the worker has an ordinary camera and lens, the extra apparatus required may be of the home-made kind, the construction of it offering no great difficulty to any one of slight mechanical ability. The first requirement is a window through which a good volume of unobstructed light from a cloudless sky enters the room.

This room should be as near the developing-room as convenient. First, the room, and the whole of the window, except a part of it through which the light for illuminating the negative comes, must be made light-tight. To block out the window make a flat wooden frame large enough to cover it. The wood of the frame should be three-fourths of an inch thick and two and three-fourths inches broad. It is best mortised together. Cover the frame with coarse unbleached calico, tacked all around. Size and dry it, allowing half a pound of size to half a

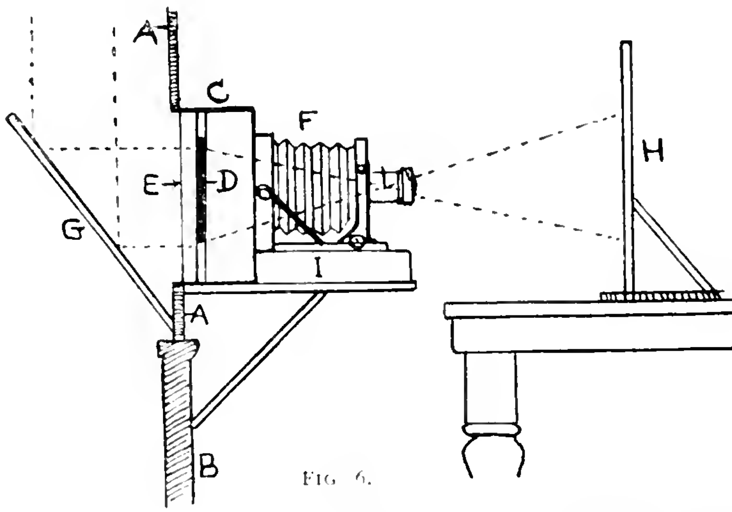


FIG. 6.

pint of water. When dry, paste two thicknesses of brown paper over the calico, which will make the screen opaque and stiff. Cut an opening the size of the camera used, out of the screen, and nail a thin fillet of wood around it. If trees or houses come in the line of sight, fix some sort of a reflector outside the window. A sheet of white cardboard or white blotting-paper will do; it must be larger than the opening in the window-frame, to which it must be inclined at an angle of 45°. This will pass the maximum volume of light and evenly illuminate the negative. Fit a wooden shelf under the opening in the window and stand the camera upon it, first removing the ground glass and placing a negative upside down and film side towards the lens in the open plate-holder. The front of the camera points into the room

and will throw an enlarged image of the negative onto the easel. To provide this, take an ordinary deal table and a drawing-board larger in area than the largest enlargement it is intended to make. To one of the longer sides of the board screw a piece of wood about an inch thick and nine inches broad, to form a base. Stand this squarely on the table, and then, on the latter, nail two strips of wood, between which the drawing-board on its base will slide stiffly. Face the board with a sheet of plain white paper, to form a focusing surface. The diagram shows a sectional view of the arrangement, which can be modified or altered in detail to suit individual requirements. See Fig. 6, in which AA represents the window frame covered with opaque material; B, the wall of the room; C, the negative box; D, the negative in grooved carrier; E, a sheet of ground glass; F, the camera; G, the reflector outside of window; H, the easel, and I, a box elevating the camera to the desired height, with the rest of the outfit.

Enlarging in the Camera

By the methods just described, the room virtually acts as the camera, but it is obvious that the camera itself may be used for projecting the image to be enlarged directly on to the bromide paper in a plate-holder. The disadvantage of the system is that it limits the size of the enlargement, a limitation that applies to all daylight-enlarging systems. The advantage is that the exposure can be made in an ordinary room. We will suppose the reader to have an 8x10 camera and lens, a plate-holder of the same size and a negative to be enlarged from. First, place the negative in a suitable position against the source of light, which we will suppose to be the unobstructed rays coming through a window. Insert the negative in a printing-frame in the usual manner, remove the hinged back, and fix the negative in position at the four corners of the frame by tacks or similar means. The frame holding the negative should be placed on a table close to the window, upright and perpendicular to the horizontal plane of the table. To insure even illumination of the negative, the north light from a cloudless sky should be availed of, the object being to get a good diffused light without the intervention of surrounding

objects, such as near buildings. The bromide paper is best placed in the plate-holder between two flat, clean sheets of glass, sensitive side outwards. This must be done in the dark-room. Light between the negative close to the window and the camera is excluded by enveloping the system with, for convenience sake, the focusing-cloth, or some other opaque, flexible fabric. To do this, rest a couple of thin rods or sticks from the top of the camera to the top of the printing-frame as supports, and cover the improvised framework with a cloth before focusing. The exclusion of this extraneous light is not essential but is advisable, as it is best if no light reaches the bromide paper except that which passes through the negative to the lens. The optics of this system require a little thought. The degree of enlargement obtained on our 8x10 sheet of bromide paper depends upon the focal length of the lens and the extension of the camera bellows. The negative we will suppose is 4x5, and we are enlarging it two diameters, that is to 8x10. The focus of our lens being, let us say, 6 inches, the camera must extend 9 inches and there must be 18 inches between lens and negative. The rule for this is as follows, and it applies to all enlargements: Divide the base of the enlargement by the base of the negative, which will give the times of enlargement. To enlarge 4x5 to 8x10 we have $10 \div 5 = 2$. To this number add 1 and multiply the total by the equivalent focus of the lens. Example, $2 + 1 \times 6 = 18$ inches, the distance from the lens center to the paper. If this distance is divided by the times of enlargement we get the distance between the lens and the negative, thus $18 \div 2 = 9$ inches. Consequently in enlarging our 4x5 negative onto an 8x10 sheet of bromide paper, the negative must be 9 inches from the lens and the camera extended 18 inches. The times of enlargement and distances for lenses of three foci are given in the table on the following page.

This is a universal system applicable to all methods of enlarging where the lens and the easel are movable factors. In enlarging cameras of all kinds, the size of the picture is limited by the dimensions of the plate-holder as already pointed out, but this is usually understood in the beginning.

TIMES OF ENLARGEMENT

Distances from the Negative in inches

Times of Enlargement	2		3		4		6	
Focus of Lens	Lens to Paper	Negative to Lens	Lens to Paper	Negative to Lens	Lens to Paper	Negative to Lens	Lens to Paper	Negative to Lens
6 inches . . .	18	9	24	8	30	7½	42	7
8 " . . .	24	12	32	10⅔	40	10	56	9⅓
10 " . . .	30	15	40	13⅓	50	12½	70	11¼

Relative Exposures

In bromide enlarging, all other factors remaining constant or unchanged, the time of exposure between one size of picture and another alters at a given ratio as the area of enlargement increases or diminishes. To find the relative exposure between one size and another, add 1 to the number of times that the length of the original is contained in the length of the enlargement. Square these figures and they will give the proportionate value of the exposures. Thus: A 6½ x 8½ enlargement from 3¼ x 4¼ negative is twice the length of the original; so, to 2 add 1 which gives us 3, which, squared, is 9. If a 10 x 12 enlargement is wanted, or three times the length of the original, add 1 to the 3=4, which, squared, gives us 16. The figures 9 and 16 supply the relative values of the two exposures. Divide the greater number by the less and 1¾ approximately is the answer. Thus, if in the first case, we gave 2 minutes exposure and found it correct, 1¾ that time or about 3½ minutes would be found correct in the second. According to W. E. Debentam the rule works out as follows:

	Exposure Times
Copying same size	1
Enlarging to two diameters	2¼
Enlarging to three diameters	4
Enlarging to four diameters	6¼
Enlarging to five diameters	9

This rule is of general application, whether the enlargement be made in the camera, or by daylight or artificial-light projection in a room.

Enlarging to Scale

In most enlarging systems the negative is a fixed factor, while the lens and enlarging easel are movable according to the size of image required. In enlarging a negative to a given number of diameters, it is useful to know how far the easel must be placed from the negative. This depends upon the focal length of the lens and the degree of enlargement. The following table gives the distances in inches. It was originally published in "The Practical and Pictorial Photographer."

Magnification	Distances Between Negative and Easel					
	Same size	Twice	Three times	Four times	Five times	Six times
Focus of lens . .	4 f	$4\frac{1}{2}$ f	$5\frac{1}{3}$ f	$6\frac{1}{4}$ f	$7\frac{1}{5}$ f	$8\frac{1}{6}$
e. g.	Inches	Inches	Inches	Inches	Inches	Inches
Focus of lens: 4 inches . .	16	18	$21\frac{1}{3}$	25	$28\frac{4}{5}$	$32\frac{2}{3}$
$4\frac{1}{2}$ " . .	18	$20\frac{1}{4}$	24	$28\frac{1}{8}$	$32\frac{2}{5}$	$36\frac{3}{4}$
5 " . .	20	$22\frac{1}{2}$	$26\frac{2}{3}$	$31\frac{1}{4}$	36	$40\frac{5}{6}$
$5\frac{1}{2}$ " . .	22	$24\frac{3}{4}$	29	$34\frac{3}{4}$	$39\frac{3}{5}$	$44\frac{11}{12}$

The column at the left-hand side of the table gives the foci of the lenses most commonly in use: the line immediately under the times of magnification is for lenses of irregular focal length. This table supplements one of the same kind already given: its particular value lies in the fact that it gives distances from negative to easel only, and ignores the space between lens and negative. It is of particular service in fixing the distance in daylight work.

Acetylene

The value of acetylene for enlarging purposes received notice in "The Photographic News" at the hands of Cecil Haywood, who, after pointing out that the best form of generator for the work is one which employs granulated calcium carbide with an excess of water and that may be recharged without affecting the burning lights, recommends a purifier of some sort for improving the quality

of the light and removing impurities. Two No. 00000 Bray's acetylene burners are found ample for sizes up to 23 x 17 inches with clean negatives of ordinary density. The great actinic power of the light enables a denser negative to be used than with most other illuminants. In the appended table of exposures the factors employed were: Light, two No. 00000 Bray's, with reflector; 5¼-condenser; clean, thin negative, full of detail; objective, 5 x 4 R. R. lens, 5½-inch focus, stop *f* 16; paper, Eastman's extra-rapid P. M. bromide; developer, eikonogen.

If the conditions are the same as above, the table may be used as it is, reading the correct exposure in the third column; and if any modification is made, a trial exposure, at a certain distance, may be made and the difference noted, when the ratio will remain constant.

EXPOSURE TABLE FOR ENLARGEMENTS

Distance in inches from lens to paper	Full size of Enlargement. Inches		Exposure Min.	Sec.
*11	4	3	..	12
12	4¾	3½	..	17
13	5½	4	..	23
14	6¼	4¾	..	29
15	7	5¼	..	36
16	7½	5¾	..	44
†16½	8	6	..	48
17	8¼	6¼	..	53
18	9	6¾	1	3
19	10	7¼	1	13
20	10½	8	1	23
21	11¼	8½	1	35
‡22	12	9	1	48
23	12¾	9½	2	2
24	13½	10	2	17
25	14¼	10¾	2	32
26	15	11¼	2	46
27	15½	11¾	3	3
§27½	16	12	3	12
28	16¼	12¼	3	21
29	17	12¾	3	39
30	18	13¼	4	0
31	18½	14	4	17
32	19¼	14½	4	38
33	20	15	5	0

*Original size. †Twice original. ‡Three times original. §Four times original. Five times original.

To use the table, enlarge to the desired size, measure the distance from optical center of lens to paper, and read off correct exposure in the last column. More often than not only a portion of the original is required in the enlargement, in which case mask off with black paper the parts not desired, as this improves the brilliancy of the resulting picture. This will, of course, not make any difference in the exposure according to the table, and any one who has worked thus will at once realize the time and trouble saved by not having to measure the full size of the enlargement to obtain the relative exposure for the portion that is being enlarged. Again, supposing the whole of the negative is to be used, one only needs to glance down the second column for the size desired in the enlargement, when the distance from lens to paper is found in the first column and the exposure, as before, in the last. Do not let unexposed sensitive bromide paper come too close to the unburnt gas or calcium carbide, as acetylene has a chemical action on the silver salts in the film, causing a brown deposit on development.

We have now dealt with the chief details of bromide-enlarging work preparatory to the actual making of the picture; we now come to exposure, development and after-treatment of the result. The reader is now assumed to be making his exposure by either daylight or artificial-light projection.

Focusing and Exposing

The apparatus being arranged in position and all actinic light excluded from the workroom, the focusing of the negative is the next step. Place the cleaned negative in the plate-holder of the camera or carrier of the lantern, upside down, and with the film toward the enlarging lens. The easel should be faced with a sheet of white paper having a smooth surface: this will make the focusing of the image a simple matter. The largest aperture of the lens should be used for focusing. The amount of subsequent stopping down will depend upon the defining power of the lens at its full aperture and the degree of sharpness desired in the enlarged image. Sometimes with $f/8$ of a rectilinear lens, some falling off at the margins of the picture will be seen; then it

will be necessary to use $f/11$ or $f/16$ for sharpening up the image and making the exposure. With an anastigmat lens, on the other hand, this extent of stopping down will not be required, owing to the fact that it gives a flat field. The use of a smaller diaphragm (or stop) doubles the exposure given with the next-sized larger stop. Thus, if with $f/8$ we give two seconds, the exposure with $f/11$ would be four seconds, and so on. Having obtained a sharp image on the easel, we next place our sheet of sensitive bromide paper in position. Here the convenience of a yellow cap for the lens will be appreciated. This cap, fitted with yellow glass, fits on the hood of the lens and passes enough non-actinic light to let us see what we are doing without danger of fogging the sensitive paper. The cap being on the lens, place thumb-tacks at all four corners of the easel; these will serve as guides to the placing of the paper in position, although, if the yellow cap passes sufficient light, their use may be dispensed with. Now place the paper in position, sensitive side outward. The paper may curl inwardly from the sensitive side. Be sure to handle the paper with every delicacy and cleanliness. Exposure is a very important point in bromide-enlarging work: upon the accuracy with which it is carried out the question of a successful result will depend. A simple way of finding out the correct exposure to be given is by the use of test strips of the paper to be exposed. Such strips are frequently found in the packages of paper sent out by the manufacturers. In the contrary case, cut a strip from the edge of a sheet of the paper in use. Mark the non-sensitive side with pencil so as to avoid confusion between right side and wrong side. The image being focused on the screen, cut the strip into two unequal parts. Attach these strips, face outwards, to the easel with pins, so that each strip takes in some parts of the highest lights and the deep shadows of the picture. The trial exposure will be purely tentative. If daylight is the illuminant, give three-quarters of a minute; a good oil lamp, five minutes; limelight, twenty seconds. Develop the strips with the developer, composed as it is to be used for the enlargement. The result will, at any rate, give an idea of

the value of the exposure for deep shadows and the margin of error, if any, noted, so that a fresh and different exposure may be tried. Another way is to make a series of trial exposures on one strip, shading two-thirds of it with a piece of cardboard for five seconds; moving the cardboard and giving the next section five seconds; and removing the cardboard altogether and giving another five seconds. This makes a series of exposures of fifteen, ten and five seconds. Upon development, if the fifteen-second portion is finished in less than a minute, and the ten takes about a minute, the basis of the experiment was about correct and it should be an easy thing to make the exposure for the actual enlargement with a reasonable chance of "hitting the mark" first time.

Development

We set about developing a bromide enlargement in precisely the same way as we treat a contact print, except that we work on a larger scale. The developer itself is our first care. *Amidol, hydroquinone* and *metol* are the reagents mostly used in development by small workers. The first yields a rich black image and works cleanly. This is a good formula: Sodium sulphite, 650 grains; potassium bromide, 10 grains; citric acid, 10 grains; amidol, 50 grains; water, 20 ounces. This solution does not keep longer than a week. *Hydroquinone* keeps well in solution, but needs the presence of an accelerator. The following is a standard formula. *A*. Hydroquinone, 160 grains; sodium sulphite, 1 ounce; citric acid, 50 grains; potassium bromide, 50 grains; distilled water, 20 ounces. *B*. Sodium carbonate, 1 ounce; distilled water, 20 ounces. For use take equal parts and add an equal quantity of water. With correct exposure this gives black tones, but by increasing the exposure and further restraining or diluting the developer, warm black and brown tones can be obtained. Hydroquinone tends to increase contrast, which is reduced by diluting the developer and increasing the exposure. *Metol* keeps well, works cleanly, gives a good color and is a favorite all-round developer for the work. The following is a reliable formula: Metol, 100 grains; sodium sulphite, 2 ounces; potassium bromide, 25 grains; potassium car-

bonate, 70 grains; water, 20 ounces. For use take one part of this solution and dilute it with four parts of water. *Rodinal* is used by some workers, in the proportion of one part Rodinal to 80 parts of distilled water; a 10 per cent solution of potassium should be at hand in case of over-exposure. *Ortol*, although condemned by some workers on account of its liability to give a pinkish tinge in the lights, nevertheless, if used with care, will give a good black color with normal exposure and a warmer black with full exposure and the addition of more restrainer. The following is a good formula: *Solution 1:* Ortol, 70 grains; potassium metabisulphite, 40 grains; water, 15 ounces. *Solution 2:* Sodium carbonate, 240 grains; sodium sulphite, 600 grains; potassium bromide, 40 grains; water, 15 ounces. For use, mix in equal proportions. This is the place and the opportunity to point out the importance of not allowing the temperature of the developing and other solutions used in bromide enlarging to fall below 60° Fahr., or exceed 65° Fahr., or irregularity of action in the operations of development, etc., will surely follow. Evenness of temperature, like cleanliness, is vital to success in dark-room work here as elsewhere.

Bolting Silk

In portrait enlargements, the use of bolting silk for getting breadth of effect and softening down heavy shadows, is worth the attention of the pictorially inclined photographer. The material is a white, stiff, square-meshed fabric made for "bolting" or sifting flour, hence its name. It is obtained from photographic dealers. In use, the silk should be mounted on a light frame. A sheet of cardboard with a rectangular opening about three-eighths of an inch all around less than the silk, answers the purpose. The edges of the silk are glued or pasted to the cardboard. The bromide paper being in position on the easel and the image focused ready for exposure, the position of the silk between paper and lens must be chosen. Broad effects are obtained when the silk is held a few inches in front of the paper. Detail is softened by placing the silk just in front of the bromide paper, but not in contact with it. In actual contact with the paper, the silk breaks up the picture into a fine grain.

in contact with the negative, a coarse-grained canvas effect results. The interposition of the silk reduces the light and consequently lengthens the exposure one-half.

Printing in Clouds

Enlargements of landscape subjects with white skies should not be made; it is not good photography to do so. If there are no clouds in the negative, and a cloud negative is at hand, it is an easy thing to fill up the blank in the following manner. Place the landscape negative in position and give the required exposure; whilst the landscape image is still on the bromide paper, mark the outline of the horizon with a soft pencil. Next, take a cardboard mask, directed as made for vignetting, cap the lens, replace the landscape negative by the cloud negative, remove the cap, hold the mask in such a position as to shade the exposed parts of the paper, and give the second exposure. Keep the mask in motion down to, but not below, the horizon line. The second exposure will be briefer than the first; to arrive at it, it is well to make test-strips from the cloud negatives as directed for ascertaining the exposure with bromide paper. In choosing a cloud negative see that it is lighted from the same side as the negative, otherwise the finished enlargement will have the absurd defect of cross lighting.

Dodging and Vignetting

While exposing our enlargement, the result may easily be modified. The light can be reduced in actinic power at will, so that, by this means, we have control over the length of the exposure. Local treatment obviously becomes simple. The light on the projected picture can be shaded where necessary by interposing a hand or a small sheet of cardboard in the path of the light rays, and greater or less exposure given to parts of the enlargement which it is desired to strengthen or weaken. The shade, if it may be so termed, should be held nearer the lens than the easel, as more diffusion results and there is less danger of sharp outlines than if a nearer position be taken. In shading a foregound to bring up a dense sky, first make a test strip or two, noting how long the shading is carried on and how long the light is allowed to act on the whole. If the sky is then over- or under-printed it can be modified in the enlargement proper.

Vignetted enlargements are those in which the picture, instead of being printed right up to the edges of the paper, is shaded off gradually to a white margin. Both portraits and landscapes may be treated this way, and ugly or incongruous parts of the picture at the margins got rid of. To vignette: cut an oval aperture out of the center of a sheet of cardboard and serrate the edges of the opening with a pair of scissors. Remove the cap from the lens and interpose the vignetter between the lens and the screen. Move the card with a gentle rotary motion during the exposure. The vignetting effect is produced by the opaque cardboard cutting off the margins of the picture whilst the exposure is going on. This prevents light action taking place on those parts of the paper that are protected.

Toning

By correct exposure and careful development, rich, deep black images are obtained in bromide enlargements. In recent years, however, fashion has declared for a variety of colors and tones in the pictures, comprising sepia, brown, blue, green, red and their intermediates. If the essential conditions which apply to all toning processes are understood and adhered to, success in the operation presents no difficulty. The image of an enlargement consists of finely divided metallic silver. Toning changes this image to another color by (1) converting the silver into one of its salts; or (2) by combining the silver with another metal. The chemical changes produce the alteration in color. Before toning, the image should be quite free from hypo and should be neither too dense, nor too weak, as the depth of the final color will depend upon the density of the image. The following formulae have been used with great success. So far as our present knowledge goes, they give permanent results, particularly in the case of the hypo-alum and sulphide methods which are popular with all classes of workers.

Sepia Tones

HYPO ALUM.—For sepia tones on Eastman's Royal Bromide, Enameled Bromide or Matte-Enamel Paper the following bath is advised: Hyposulphite of soda, 5 ounces; ground alum, 1 ounce; boiling water, 70 ounces. Dissolve the alum in the water and then add the alum

slowly. A milk-white solution results which should be decanted when clear. It is not used until cold (about 60° Fahr.). The prints having been thoroughly washed after development and fixation, are placed in this bath until the desired color has been reached. They should be moved about occasionally during the first few hours of toning, which takes about 20 hours. They should be immersed, face down, in the bath and after toning washed thoroughly. THE SULPHIDE PROCESS.—Brown or sepia tones also result from the use of what is known as the sulphide toning process. In this the image of the print is first converted into a salt of silver, the bromide, chloride, iodide or ferrocyanide and then into a brownish pigment known as silver sulphide. The enlargement having been completely fixed and washed, let it be treated with one of the following solutions: (1) Potassium ferricyanide, 10 grains; potassium bromide, 10 grains; water 1 ounce; or (2), potassium ferricyanide, 20 grains; sodium chloride (common salt), 30 grains; water, 1 ounce. The image will be bleached by either of these solutions in a few minutes, the whitish appearance of the deposit being caused by its change into a salt of silver. After five minutes' washing in running water, the next step is to apply the sulphuretting solution, which will tone the image by changing it into a brown deposit of silver sulphide. Sulphuretted hydrogen, ammonium sulphide and potassium sulphide are used for the purpose, but they have a very objectionable odor of sulphur, which also attacks and tarnishes silver and other metallic articles in the house, and injures photographic plates and papers. For those reasons, the three bodies named are best avoided. R. E. Blake Smith, who has given the greatest attention to the subject, recommends the use of the comparatively odorless and harmless sodium monosulphide (purified for analysis) for the purpose. Dissolve 3 ounces of the salt in 15 ounces of water, boil the solution for about 10 minutes, filter off the black precipitate formed, and when cool make up to 25 ounces with water. To tone the print take 12 per cent stock sodium sulphide solution, 1 ounce; water, 12 to 20 ounces. The print should be left in the solution for two or three times as

long as the toning takes for completion. Five or ten minutes' final washing is then necessary. The color of the image ranges from brown to brown-black, according to the quantity of silver in the picture. The deposit in the enlargement now consists of silver sulphide, one of the most stable substances known. In order to avoid the odor caused by the use of the sulphides for toning purposes, H. E. Smith has recently experimented with the thiomolybdates of sodium. Greater permanency of the image is also claimed by the use of these salts. This toning process is placed on the market under the name of the Thiomolybdate Sepia Toner; it consists of separate bleaching and toning solutions, and the process is well spoken of by experts.

Red Tones

COPPER.—This method gives red tones. Dissolve 100 grains of ammonium carbonate in 2 ounces of water, and in this solution dissolve 10 grains of sulphate of copper. Then add 20 grains of potassium ferricyanide. A clear, dark green solution results which gives a red-chalk tone in about three minutes. Tone until the deepest shadow is converted and then wash the print for ten minutes.

Green Tones

VANADIUM.—This gives an emerald-green color. Bleach the enlargement in the following: Potassium ferricyanide, 10 grains; ammonium carbonate, 100 grains; water, 1 ounce. Wash well and apply: Ferric chloride, 2 grains; vanadium chloride, 2 grains; ammonium chloride, 4 grains; hydrochloric acid, 5 minims; water, 1 ounce.

Blue Tones

IRON.—This gives a blue tone. Bleach the enlargement in: Potassium ferricyanide, 10 grains; ammonium carbonate, 100 grains; water, 1 ounce; then tone in ferric chloride, 5 grains; hydrochloric acid, 5 minims; water, 1 ounce. For these last three formulæ we are indebted to C. Winthrope Somerville, who has successfully experimented in the color-toning of bromide prints.

Mounting and Finishing

The mounting of a bromide enlargement is much governed by individual taste. A few general hints on the subject will suffice. Plate-sunk mounts suit many subjects. They usually have a central tint, which should be of

the same color as the print: cream or buff or light brown for brown and sepia-colored enlargements and pale gray for black ones. Cover and folder papers, neutral in tint and rough of surface, make effective mounts. Many enlargements being already made on heavy rough papers do not, of course, need mounting. For ordinary purposes Higgins Photo-Mounter makes a good adhesive. To mount an enlargement: Spread a clean sheet of paper upon a table. Upon this, face down, place the enlargement previously trimmed, and apply the mountant with a stiff hog-hair brush, such as painters use. Spread the paste evenly over the surface and go over it quickly a second time. Having marked the four corners of the mount lightly with a pencil, the pasted print is lifted by two opposite corners and taking the penciled marks as guides, is carefully laid on the center of the mount. Next apply a squeegee, or rub down with a lintless blotter, working from the center of the print. This makes perfect contact and excludes air-bubbles. A clean, soft sponge removes any superfluous mountant at the edges of the print by the pressure of the squeegee or the blotter.

Defects and Failures

Faulty manipulation may be set down as the cause of most of the defects to which bromide enlargements are liable; to a list of those defects we add a number of remedies which should help the worker in his difficulties. A common defect is that of **hardness and excessive contrast** in the print. This is probably due to under-exposure or to the use of a negative having such defects. Development with hydroquinine sometimes produces harsh contrasts. If, when the developer is applied, the image is very slow in appearing, it is a sure sign of under-exposure. **Flatness and lack of contrast** are caused (1) by over-exposure or (2) by too strong a developer. In the latter case pour off the developer, wash the print, dilute and restrain the developer, and the enlargement may be saved. **Yellow prints.**—A very common defect, and traceable to many causes: (1) The use of an old developer; (2) an old hypo bath; (3) contamination of the developer with hypo; (4) prolonged development; (5) insufficient clearing. A yellowed print may sometimes

be brightened up by immersing it in: Pure hydrochloric acid, 1/4 ounce; saturated solution of alum, 20 ounces. Imperfect washing between development and clearing, or after fixation, sometimes causes yellowness. **Greenish tones** are caused by over-exposure and too much bromide in the developer. **Fogged images** result from the use of an unsafe light before or during development; too strong a developer; or a contaminated fixing bath. **Green and gray prints** result from under-exposure or too much bromide in the developer. They are caused by a strong accelerator insufficiently restrained by bromide. **White spots** arise from small bubbles forming on the surface of the paper when the developer is applied. The bubbles, as they appear, should be removed with the tip of a clean finger or a camel's-hair brush. **Yellow patches** may be due to an insufficient use of the clearing bath. **Local stains** proceed from traces of hypo or developer in the graduates or on the fingers: in short, by carelessness and want of cleanliness in the manipulations. Blisters proceed from the use of warm water; too strong an accelerator such as caustic soda or potash; or by allowing a jet of cold water to play on the print whilst it is washing. Immersion of the print in a bath of common salt and water after fixing is a suggested remedy. **Mealiness** and want of vigor in the prints may be due to over-exposure and inert chemicals. **Development marks** are usually the result of carelessness in applying the developer. As we have already directed, the solution should be flowed on with an even sweep and the whole of the paper covered. The exposed paper should always be soaked in clean water until quite wet and limp. This will ensure the easy flow of the developer over the surface. The tray should be rocked during development and in both directions, or streaky prints may result. **Abrasion marks** on smooth papers are caused by drawing them over the edges of the dishes, and will show like pencil marks on the developed prints. These can be developed by rubbing the dried picture with a tuft of abundant cotton moistened in a solution of water, 1 1/2 ounces; Columbia spirit, 1/2 ounce; and two drops of ammonia. **Black Spots** are caused by particles of dirt or chemicals settling on the

emulsion side of the paper. Some optical defects in enlargements remain to be considered. **Distortion of the image** after exposure may be due either to the paper cockling during exposure, or not being optically flat on the easel. The dried paper may absorb moisture from the atmosphere and expand in consequence; if it is soaked in water immediately before exposure and pinned on the easel it will not expand during development. **Unequal illumination** of the image is an optical fault and may be due to the use, in daylight enlarging, of a lens too short in focal length, as it is so close to the negative that it produces less illumination at the margins of the picture than at the center. The same fault may be caused by the light, the condenser and the lens not having been properly centered. The condenser should converge a small cone of rays into the lens. To produce this: First focus the image to the required size, remove the negative and adjust the light on the easel till the circle has no shadows or patches.

Conclusion

This monograph makes no pretension of having treated all branches of the subject exhaustively or by reference. This will explain why many sections of bromide enlarging work are not touched upon. We have simply endeavored to redeem the promise made in the title, viz., to show how easy that most popular of all processes, Bromide Enlarging, really is.

BOOKS

Bromide Printing. By F. C. Lambert. 71 pp. 1902. 50 cents.

Practical Enlarging. By John A. Hodges. 137 pp. 1904. 50 cents.

Enlargements: Their Production and Finishing. By G. R. Smith. 127 pp. 1902. 50 cents.

Photographic Enlargements. By Geo. H. B. Wheeler. 130 pp. 1901. 50 cents.

Toning Bromides. By C. W. Somerville. 112 pp. 1906. 50 cents.

Toning Bromide Prints. By R. E. B. Smith. 96 pp. 1904. 50 cents.

Notes and Comment

Alfred Horsley Hinton. We regret to record the death of Mr. Alfred Horsley Hinton, editor of *The Amateur Photographer* (London), which took place on Monday, February 25, in his 45th year. He succeeded Mr. E. J. Wall in the editorship of our contemporary during the latter part of 1895, and it cannot be doubted that his twelve years' charge of that journal was conspicuously successful. Amongst photographic journalists he was a most prolific and, it should be said, somewhat diffuse writer. As far back as 1889 he edited the defunct *Photographic Art Journal* and commenced the publication of the clever combination photographs that gained him much popular, but undiscriminating, applause. He contributed to The Photo-Miniature series; wrote a *Handbook of Illustration*; many brochures on pictorial photography, platinotype printing and cognate subjects, and was the photographic editor of the "London Times," "The Daily Telegraph," "The Daily Graphic," "The Yorkshire Post" and other newspapers. Mr. Hinton's output and industry were, it will be seen, very great, and it is to be feared that the quality of his work suffered in consequence. He will be remembered as one of the founders of the London Photographic Salon, of which he was an extremely zealous supporter. Hinton certainly led a busy, full and active life in the aggrandizement of his photographic ideals; but the knowledge of his early end leaves us with the reflection that his influence on the pictorial movement in photography will be transitory, by reason of the very crowded interests and inconsistencies which marked an otherwise brilliant and successful career.

Brief mention was made in our last issue of a bundle of mounts and cover papers suitable for single and mul-

tiple mounting, folders, etc., received from the Mittineague Paper Company, of Mittineague, Mass. A leisurely survey of these new introductions confirms our favorable first impression of them, and we are glad to bring them more directly before our readers. Since, however, no printed description can convey the subtle qualities of color, texture and finish which make these papers so desirable for photographic use, we must content ourselves here with a mention of two or three varieties, and the suggestion that the reader seeking to enhance the value of his prints by artistic mounting should write the manufacturers for samples of such papers as may seem likely to serve his particular requirements.

The Old Stratford and Old Cloister papers, made in several colors, weights and finishes, suggest many delightful combinations for exhibition and portfolio work, apart from their suitability for folders for professional portraiture. Similarly the Vellum series of mounts, Nos. 738-746, offers a very desirable advance upon anything of the sort we have seen among the conventional lines shown by the stockhouses. This series comes in sheets, 22½ x 28½, in several thicknesses in white, buff and brown—all soft colors. The Rhododendron series also offers a wide range of material which will gladden the heart of the man seeking "something different." We are pleased to hear that the Mittineague papers and mounts are now obtainable through dealers in photographic supplies.

Referring to the paragraph on cemented vs. uncemented lenses on page 418 of THE PHOTO-MINIATURE No. 81, a reader sends us practical proof that cemented lenses pass quite as much light as uncemented lenses in a given exposure time—all theories to the contrary notwithstanding. The proof is a triplicate negative showing three exposures of an object outdoors, made by a single exposure with three different lenses, two of which were cemented and the third an uncemented objective. In making the test, the three lenses were mounted in an adjustable sleeve on the same

frontboard, so that each lens could be focused separately. The focal distances were then carefully measured with an accuracy of one-tenth of one per cent, and the diameters of the diaphragms calculated with which the lenses would give a speed of *f*/8. The diaphragms were turned out to the exact diameter and then applied to the respective lenses. A focal plane shutter was mounted in front of the lenses to secure exactly the same exposure for all three objectives, and a funnel of dead black cardboard was mounted on the back of each lens, extending to within half an inch of the plate to prevent overlapping of the images. After exposure the 10 x 12 plate was developed in the usual way, with the result that the first two images to appear were those given by the cemented lenses, that given by the uncemented objective being last in appearance and slightly less dense than its neighbors. A careful repetition of the test confirmed these results which, we confess, surprised us considerably.

A puzzled reader writes to ask the meaning of the symbols M. C. W., sometimes found in photographic formulæ, e. g. sodium carbonate, M. C. W.; pyro, M. C. W. and so on. These are the initials of the Mallinckrodt Chemical Works, St. Louis, one of the largest and most reputable of our chemical manufacturers, whose products are everywhere recognized as of standard excellence and purity. Where these initials appear in a formula they indicate that the author of the formula prefers the use of the products of the Mallinckrodt Chemical Works. Readers who are not acquainted with these products can add to their knowledge in a profitable way by writing to the Works for their Chemical List.

The Ansco Company, of Binghamton, N. Y., advise us that the demand for Cyko paper, Ansco films and other Ansco specialties has so largely increased that they have established branch distributive offices as follows: New York City, 40 East 21st. Street; St. Louis, Mo., 407 North Broadway; Cincinnati, Ohio, Andrews

Building; Boston, 101 Tremont Street; and the following wholesale agents: Burke & James, Chicago; Western P. S. Company, San Francisco; Schaeffer P. S. Company, Houston, Tex.; Gailey Supply Company, Seattle, Wash.; Woodard, Clarke & Co., Portland, Oreg.; and Baltimore P. S. Company, Baltimore, Md.

The steadily growing sale of THE PHOTO-MINIATURE No. 73 tells us that more and more photographers are turning their attention to panoramic photography as a source of pleasure or profit. Those who have experienced any difficulty in the printing of panoramas made with a Kodak or other hand camera, as well as those who have been deterred from attempting this work by imaginary difficulties in printing, will doubtless be glad to know that the Mellen Photo Company, 96 Fifth Avenue, Chicago, offer to make panoramic prints from several negatives at moderate charges. Readers interested should send six one-cent stamps to the company for instructions in the making of the negatives—an inexpensive correspondence course, most surely!

Among the announcements in this issue will be found a list of Specialties for photographers prepared and marketed by Winsor & Newton, the well-known artists' supply concern, of New York and London. While the transparent oil and water colors manufactured by this firm are well known and widely used by photographers and colorists all the world over, their other photographic specialties are as yet comparatively unknown on this side of the Atlantic. Among these may be mentioned the Monochrome Tints, eleven in number, offering a wide range of color pigments peculiarly adapted for spotting carbon, bromide and other prints as well as negatives. We have used these Tints with a great deal of satisfaction and heartily recommend them to our readers. The Retouching Medium and Negative Varnish made by this house deserve equal commendation for their good drying and smooth-working qualities. A complete list can be had from Messrs. Winsor & New-

ton, 298 Broadway, New York, and is well worth asking for.

A recent letter from the always original and ever delightful F. Dundas Todd (may his tribe increase!) tells us that the Oregon bee is out of his bonnet and that he will spend the summer with his family in Victoria, B. C., Canada. Telephotography is his latest hobby, and he sends us an interesting glimpse of Mt. Wagner, in southern Oregon, to prove it. The place looks horribly lonesome from our "little old New York" viewpoint, and we do not wonder that the socialistic Todd turns his toes happily toward town life and gabfest in Victoria, B. C. What are we here for?

A useful pocketbook of Standard Metol Formulas, for use with the principal brands of plates, films and papers, has been compiled from the makers' formulas by F. Harry Hall, and is published for free distribution by the Berlin Aniline Company, 215 Water street, New York. It was a happy thought on Mr. Hall's part to get these scattered formulas together in so handy a form, and every photographer from San Juan, P. R., to Manila, P. I., should have a copy in his waistcoat pocket. Some ancient theories about fixing are treated with scant ceremony on pages 16 and 17, which should be seen.

By the courtesy of the Anderson Supply Company, of Seattle, Wash., we learn that all kodaks and cameras not larger than 6 x 8 in size may be used, without fee or charge, in the grounds and buildings of the forthcoming Alaska-Yukon-Pacific Exposition, 1909, provided that a tripod is not carried or employed. This is welcome news, and should serve to popularize the Exposition with photographers everywhere.

By pure mischance we have neglected to note in these pages the appearance and rapid growth of "Abel's Pho-

tographic Weekly," the latest and undoubtedly the lustiest of Juan C. Abel's innumerable journalistic progeny, born December 7, 1907, and now in its fifteenth week. The youngster runs away from all the other journals in newsiness, personalities—most of them pointed—and general up-to-dateness. Life would be dull without it. $1 per year. 18 East 23d street, New York.

Remarkably ingenious, and as simple as ingenious, is the new Premo Developing-Tank, just introduced by the Rochester Optical Division, Rochester, N. Y. It completely solves the problem of developing for the thousands of happy users of the Filmpack (ourselves included), and will surely convert the rest of the world to the unspeakable conveniences and pleasures of this best of cut-film systems. A full description of the new Tank will appear in an early issue of THE PHOTO-MINIATURE, but the breathless ones will find it all in the 1908 Premo catalogue, at the nearest supply store.

Nearly twenty years ago we got a lot of satisfaction out of a 4 x 5 Korona camera, fitted with a Turner-Reich anastigmat. After some years' steady use the outfit was passed on to a Franciscan friar and shared his wanderings through a big mission field in northern California—doing yeoman service in a good cause until it fell apart from continual wear and tear. When the friar sought a new camera, it was a 1908 Korona Series he wanted, fitted with the old Turner-Reich anastigmat, "as good a lens as any man could wish." This speaks well for the products of the Gundlach-Manhattan Optical Company, of Rochester, N. Y., and deserves noting by those who seek good value in buying a photographic equipment.

The publication offices of "American Photography" have been removed to 6 Beacon Street, Boston, Mass., and Mr. Frank R. Fraprie will, from this time on, have

entire charge of the editorial and advertising departments of the magazine, which will hereafter be conducted from the Boston office. Mr. J. P. Chalmers, owing to the pressure of his duties as business manager of the "Moving Picture World," retires from active connection with "American Photography" from this date.

The Barnet bromide papers and Oyster-shell gaslight papers, so long favorably known and widely used by English photographers, are now obtainable in this country from the American agent, J. L. Lewis, 379 Sixth Avenue, New York. A postal card to the address given, will bring the booklet, which is brimful with useful and interesting information about bromide printing and enlarging.

A booklet which all who intend to attempt enlarging should see has just been issued for free distribution, by Messrs Burke & James, Chicago. It bears the title "Enlarging with a Lantern," and tells of the many desirable conveniences and enlarging lanterns manufactured by this house, whose motto is :—Efficiency, Reliability and Reasonable Prices.

We have received from Messrs Taylor, Taylor & Hobson, Ltd., 1135 Broadway, New York, an advance copy of their new "Catalogue of Cooke Anastigmats," in which we find much interesting information concerning these famous lenses. Among the new introductions we note several additions in the lists of Series II, III, and IV; a completely new Series IIIa—anastigmats of light, and compact form, working at *f*/6.5 and mounted with special regard to their use in Kodak, Graflex, Century, and Premo cameras; and a new Portrait Lens (Series VI) with an aperture *f*/5.6. This latter is supplied with a special mount with rotating rings, which control the definition and work the iris diaphragm, this being operated from the back of the camera by means of a clever system of cords and pulleys, which must be

seen to be appreciated. By this device the portraitist can watch his ground-glass and regulate to a nicety the "depth of focus," the modeling of the image and the volume of light on the plate. The Series at present includes three focal lengths for 8 x 10, 10 x 12 and 11 x 14 plates, and will be best appreciated by photographers who follow the highest ideals in portraiture.

Several pages might be well spent in an analysis of this catalogue and its many attractive items, but the reader will doubtless prefer to look through it for himself with his own special requirements in mind. The fact that some of the lenses have been modified in price as compared with former catalogues should burden the mail of Messrs Taylor, Taylor & Hobson, Ltd. with requests for the new list—free on application.

By the retirement of Mr. George Davison from the General Managership of the British branch of the Eastman Kodak Company, a conspicuous figure disappears from the photographic world, though not, it is to be hoped, from active interest in camera work. So long ago as 1885, Mr. Davison made a name for himself in pictorial photography. For many years he was the untiring secretary of the London Camera Club, which surely would never have collapsed had such a man as Davison continued in charge of affairs. He was also one of the founders of the Photographic Salon (London). We hope Mr. Davison will write his reminiscences. Things ruled lively in the years 1892-93, when the Salon was born and one of "we two" threatened to write the epitaph of that institution.

Are photographic societies doomed? is a question that has recently been asked in the photographic press of America and Great Britian. The answer would seem to be that there is a distinct falling off in the number of those bodies, for what reason it would be idle to discuss. Concurrently, however, there is no abatement of public interest in the practice of photography by amateurs, to judge by the sale of THE PHOTO-MINIATURE, which

increases steadily in all parts of the world. But if societies come and go with regrettable celerity, at least one that we have in mind shows all the best signs of longevity. The London and Provincial Photographic Association has recently marked its twenty-sixth year of existence by taking new premises at "The Olde Napier Tavern," in the City of London, and has celebrated the move by the old English custom of a house-warming. Probably no photographic society in existence has been more fruitful in valuable discussions than the "L. and P.," to which we wish a prosperous future under the guidance of A. Haddon, T. E. Freshwater, S. H. Fry, and other noted men whose names and work will be familiar to American readers. Let the "L. and P." flourish.

A wide circle of his admirers will be pleased to learn that Dr. P. H. Emerson, the author of "Naturalistic Photography," and the acknowledged founder of modern pictorial photography is still busy with his literary work. We hope at an early date to present some of his latest writings to the American photographic public, either in these pages or elsewhere. It is not generally known that the Doctor is the author of a whole series of works describing and illustrating nature life in the East of England; of novels—one of which, "A Son of the Fens," was declared by Professor York Powell, of Cambridge, one of the greatest critics of his generation, to be a masterpiece—books of verse, and other literary output. The latest manifestation of this remarkable man's versatility is a scientific handling of the game of billiards which has earned the endorsement of professional experts.

The annual election of officers and council of the Royal Photographic Society (London), took place recently. T. C. S. Mummery, A. R. I. B. A. continues as president, and the general body remains about the same in constitution as last year. We, however, note the disappearance of the veteran, John Spiller, F. C. S.,

from the governing body. It is more than half a century since Mr. Spiller took up experimental work in photography. He was president of the society about thirty-three years ago, when the American Journalist, W. J. Stillman (since dead), led a reform movement which ousted Glaisher, the aeronaut, and others of the old brigade. New blood on the council of the R. P S. is represented by T. Thorne Baker, F. C. S., and F. Martin Duncan, who, by the way, was the first to apply the cinematograph to natural history purposes.

Amstutz Handbook of Photoengraving. By N. S. Amstutz. Third edition. 440 pp. 143 illustrations. Price, $3. Chicago: Published by The Inland Printer Company. This book is a revision of "Jenkins' Manual of Photo-engraving," the second edition of which appeared in the year 1902. It is also an enlargement of it, for whereas the former volume occupied 169 pages, the present one, it will be noted, has grown to three times the size of its predecessor. This remarkable expansion must, of course, be taken as evidence of the increasingly important part which photo-engraving is assuming amongst modern methods of illustration. To the agreeable task of noticing the "Handbook" the present reviewer brings some knowledge of the condition of photo-engraving economics in the Old World as well as the New. The volume therefore presents itself for notice in circumstances of peculiar interest. The earlier sections deal with the economics of our subject: the shop and office arrangements—and the artist's quarters, thus getting down at once to the business side of matters. In the photographic and etching sections extending to about 200 pages, the entire ground of photo-engraving practice is covered, and we are pleased to perceive the exhaustive way in which the author has set about his task. But we don't like Mr. Amstutz' spelling: "chlorid," "iodid," "cyanid," are to our eyes barbarisms. Succeeding sections concern themselves with finishing, mounting and proving. The competent hand of Mr. F. E. Ives next asserts itself in a contribution on the theory of half-tone and trichromatics and

Mr. Amstutz has been fortunate in securing the coöperation of Mr. S. H. Horgan, for a final section on Three-Color Process work in which he tells the photo-engraver what he must know in undertaking three-color block-making. Weights and measures: formulae and a glossary complete the book. We are struck by the practical and informative nature of this excellent handbook, the author of which is thoroughly equipped for his task. The illustrations and diagrams are instructive as well as numerous and the book deserves to have a large sale amongst the photo-engraving craft.

The American Annual of Photography, 1908. Edited by John A. Tennant. 336 pp., illustrated. Paper covers, 75 cents; postage, 17 cents; library edition, $1.25; postage, 22 cents. New York: George Murphy Inc., trade agents. The oldest and now the only American photographic annual in the world has passed its majority and entered its twenty-third year of existence. Contemporaneously with a change of publisher, a new hand takes up the editorial work and the result is necessarily seen in some alterations and improvements which give promise of even better things in succeeding issues. He who takes over the direction of an old established publication with a light heart usually undervalues the difficulties of the transfer, and probably the new editor of the "American Annual," having profited by his recently acquired experience, will bring out his book for 1909 somewhat earlier than the present one. In fact, it may be predicted with tolerable certainty that he will. This is obviously not the place in which either a conventional critic or a review of the Annual should appear. It must suffice to say, therefor, that the traditions of former annuals have been respected in their most recent successor. The scores of articles cover almost every modern application of photography: The hundreds of illustrations, of which thirty-two are in color, show technical and pictorial photography in its newest aspects. If space permitted, the present reviewer would like to quote from some of the many favorable opinions that he has read in regard to the book. Failing the opportunity to do

so, it remains only to add that the reception of the book at the hands of the public has been extremely gratifying to all concerned.

Friction Marks on Bromide Papers.—This is a subject of ever-pressing interest to photographers, as the black streaks and markings which appear, more particularly on glossy postcards, very much disfigure the prints and sometimes quite spoil them. Pressure and friction with any hard object or substance causes the coated paper to show these markings, as Professor Namias observes in the last issue of Eder's *Jahrbuch der Photographie.* According to experiments carried out by the author, the keeping qualities of bromide paper depend to a very large extent upon the nature of the substratum, or under layer, the usual baryta and gelatine coating being the best. Glossy bromide paper, which is far more susceptible to markings than matt, is coated on "baryta paper," and the emulsion is prevented by the heavy substratum from sinking into the pores of the paper, and the finished product seems for this reason to be more sensitive to friction. The usual remedy is of course to rub the dry prints with a piece of wadding moistened with Columbian spirit, but it is obviously easier to avoid the markings altogether if possible. Rubbing one piece of glossy paper against another in taking it out of the packet is sufficient to cause an "electric streak," and careful avoidance of friction is to be recommended throughout, in order to prevent what seems to be more or less of an accepted trouble with this class of paper.

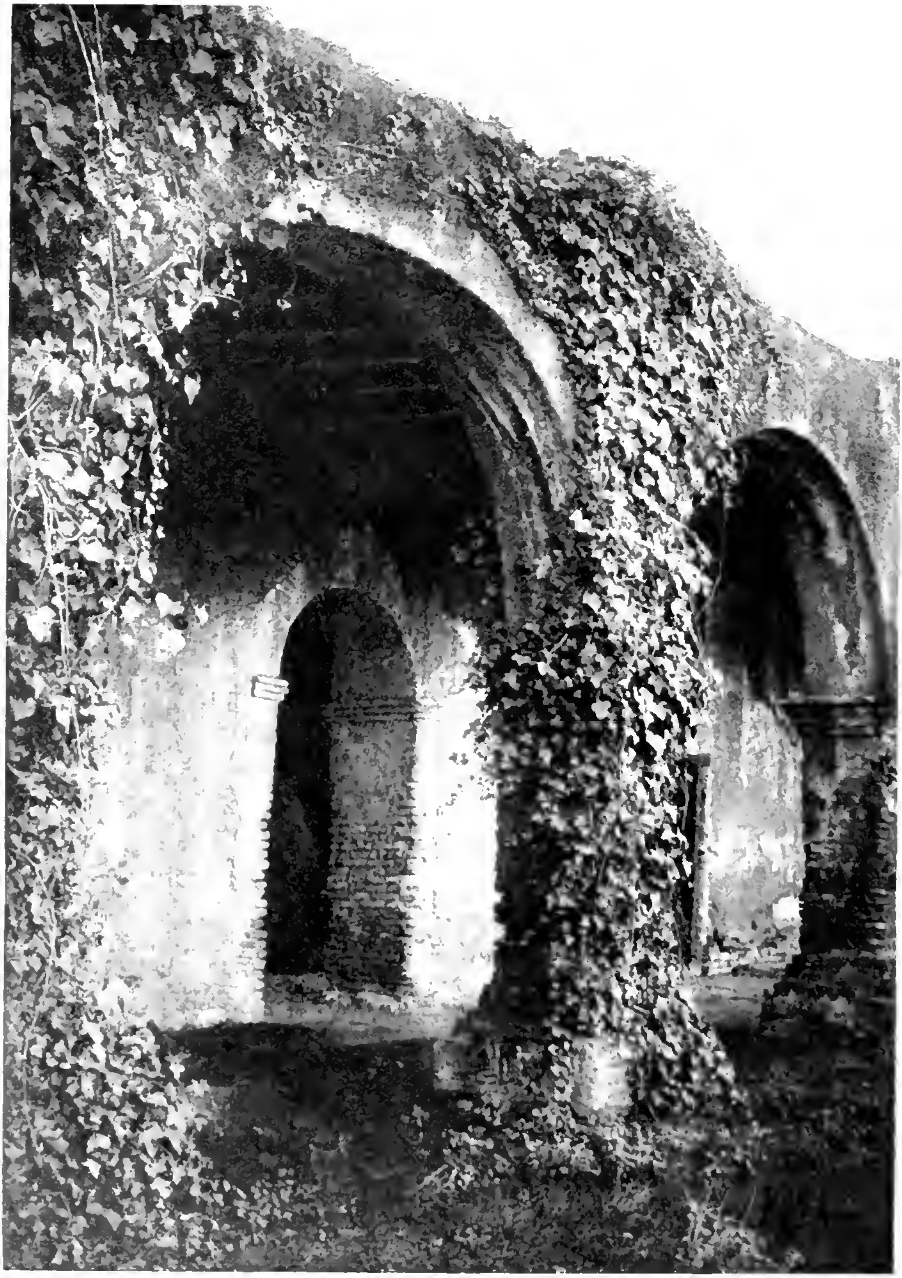
San Juan Capistrano Mission, California
Edgar A. Cohen

At Santa Barbara Mission, California
Edgar A. Cohen

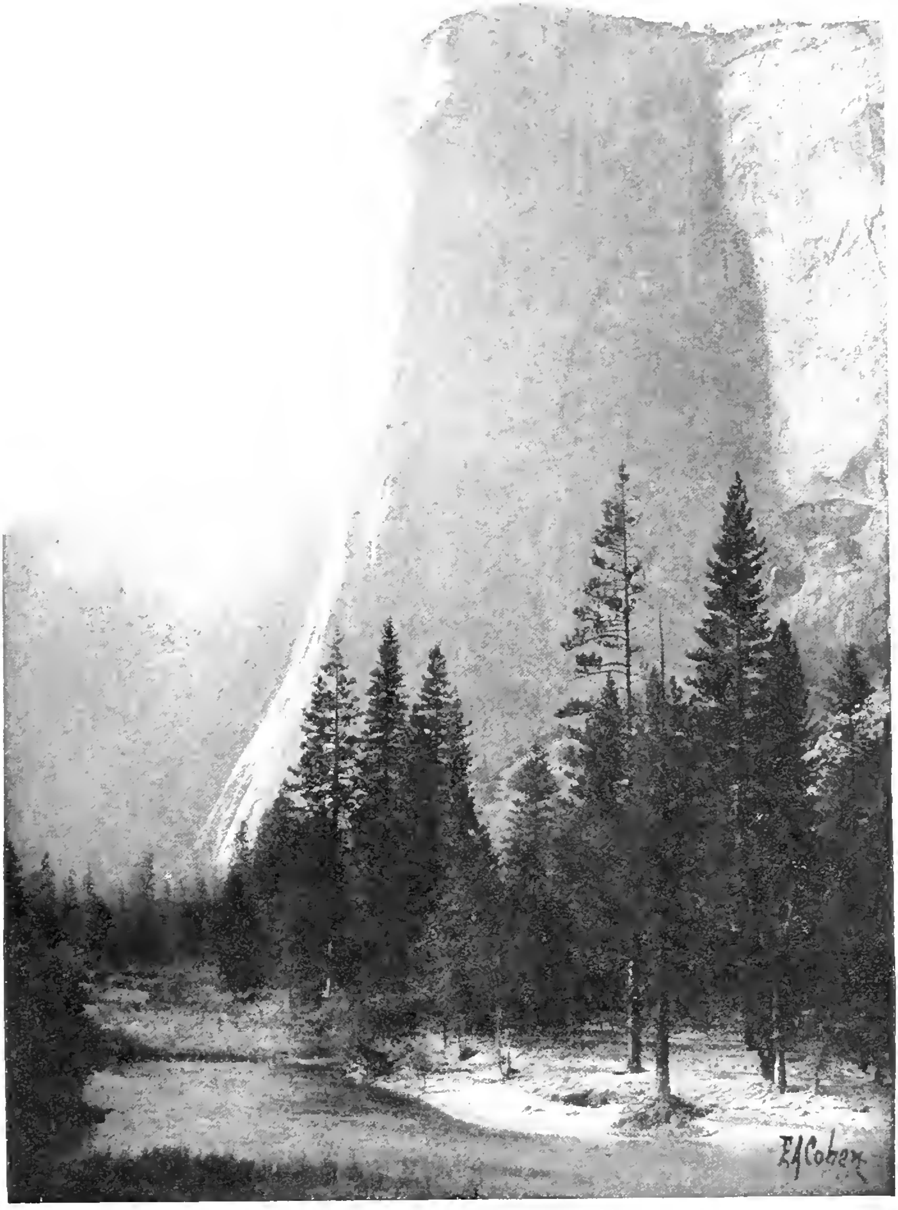
Yosemite Falls (2,600 feet)
Edgar A. Cohen

San Juan Capistrano Mission, California
Edgar A. Cohen

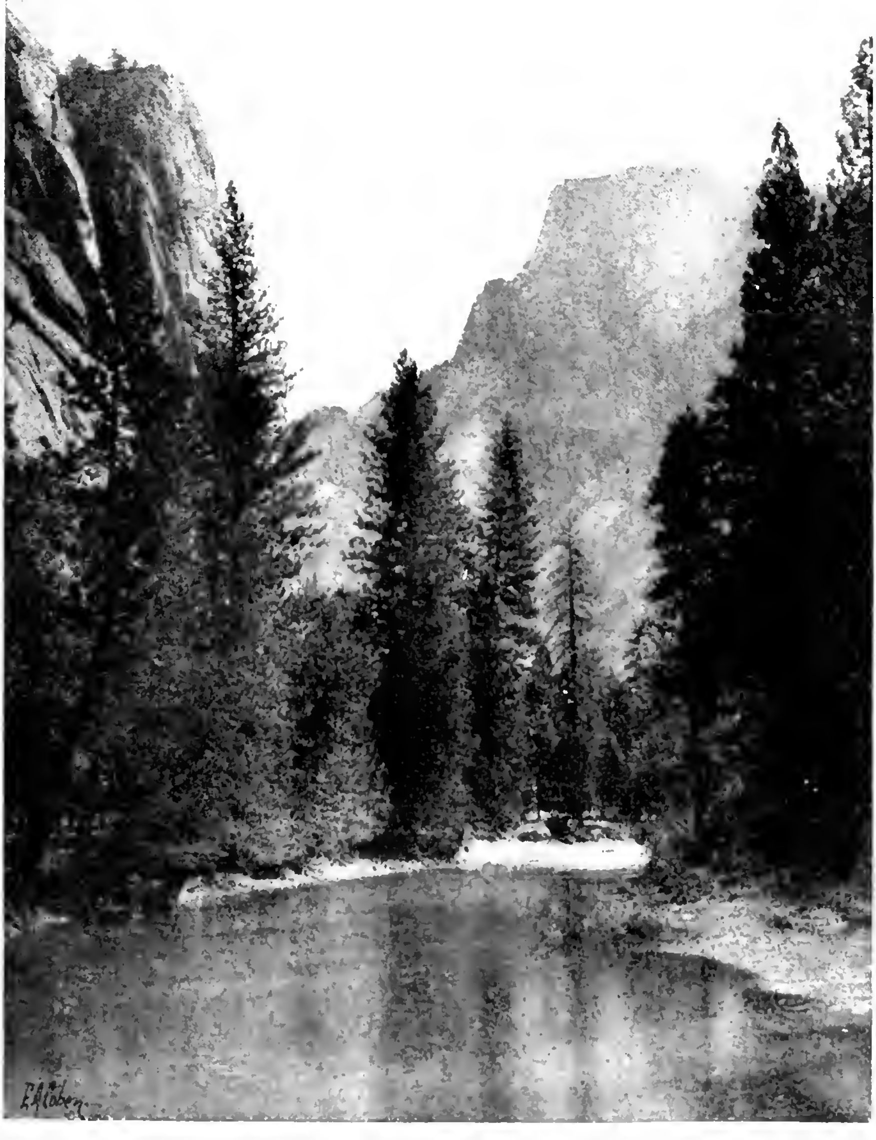
San Juan Capistrano Mission, California
Edgar A. Cohen



San Juan Capistrano Mission, California
Edgar A. Cohen



Evening shadows on El Capitan, Yosemite
Edgar A. Cohen



Washington Column and Half Dome, Yosemite
Edgar A. Cohen

The Photo-Miniature

A Magazine of Photographic Information

EDITED BY JOHN A. TENNANT AND THOMAS BEDDING, F. R. P. S.

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Defective Negatives: With Practical Remedies

The "Autobiography of a Photographic Negative" is a book that has yet to be written. If opportunity served, it would form an attractive number of THE PHOTO-MINIATURE. But that time has not come. In the hands of a qualified writer, the subject would furnish matter for a readable volume, which would create for itself a unique and permanent place in the literature of photography. For, in addition to telling us how the glass or the celluloid, which constitutes the support of the sensitive film, was prepared, it would naturally trace, in detail, the life-story of the gelatine and bromide of silver; intimately describe the many and intricate processes of manufacture through which those substances pass, and recount the various stages of completion the dried film, or plate, makes before it reaches the hands, securely boxed or packed, of the person who is master of its future fate. It is here, to quote the every-day locution, that the fun starts. Students of mural literature which once advertised a popular Encyclopedia of Education may recall its general scheme. There was the picture of a child, of whom it was asked, what will he become? This, or that? This way he was pictorially shown, thanks to a good education, to have progressed through the various stages of life, up to a successful old age; that way, owing to educational neglect, and other

causes, he took the downward path to melancholy senility. So of the exquisitively sensitive product, a photographic plate or film, which has cost so much time, labor, thought and skill to perfect, we may ask, before it starts on its active career in the camera, what will it become? We all hope, and sometimes expect, that it will become a perfect negative. Will it? The photographer alone can decide.

To prolong the parallel between the innocent child and the sensitive film, we see that both are pretty much in the hands of external influences—those mysterious "circumstances over which they have no control." If life were always lived according to universally accepted rules, the human race would be different to what it is—and, perhaps, better. In like manner, if we all produced our negatives strictly according to the scientific method, we should have such an all-round high level of technical excellence—there would be so few defects—that no remedies would be wanted, only accidents and inevitable errors would remain for treatment, and we should be well on the way to a photographic millenium. But as we do not appear to have started very far on that journey, and human nature—photographic human nature—seems just about as fallible as it always was, despite the promulgation of any number of "fool-proof" methods, the call for a new number of THE PHOTO-MINIATURE devoted to negative defects and remedies has been raised and is herein answered by the reader's dutiful servants out of their own experiences.

The Adventure Outlined

In this book, therefore, we have in our mind's eye, the passage of the sensitive film along the devious paths it must necessarily traverse before it reaches its destination, the printing-frame, in excellent shape and with the reputation of being a good printer, which should be the pinnacle of a negative's ambition—were the negative a thing of sentiency. To come down to earth, the defects to which negatives are liable manifestly occur before, during or after exposure: and so on with development, fixation, washing, drying and after-treatment. We will deal with each probable defect seriatim and, wherever practicable, suggest a remedy or a pre-

ventive. So that, if the reader has hitherto failed to make good negatives as frequently and as easily as he could wish—and the "he" embraces "she,"—let him or her take heart of grace, apply the moral to be learned from a study of the vicissitudes to which the sensitive film is subject in its travels through the camera and the dark-room: and the production of good negatives will become a thing of greater ease than heretofore. For that way lies photographic happiness and success. Going to the beginning of things, let us take two points, the neglect of which is responsible for the presence of many puzzling and obscure defects: the water with which we make up our solutions and the temperatures at which these solutions are used.

Water The quality of the water used in development largely influences the quality of the negative. In or near towns it is often contaminated with organic matter which discolors the solutions and stains the film. Alkaline carbonates; chlorides and sulphates are generally present in minute quantities; in the developing- and fixing-solutions they may be disregarded: in the washing waters they are apt to form powdery deposits on the surfaces of negatives. Minute particles of iron carried by the water through pipes and fittings often exist in the developing-solution and may cause black spots on the negative by reducing the silver in contact with them. There is no remedy for these spots. So that the water for development should be suitable: boil or filter it, or intercept it through a piece of flannel tied over the tap. This will filter off the impurities. If such preventives have not been used and there are powdery deposits on the film, a clearing-bath must be used. For formulæ, see the section devoted to "Stains on Negatives."

Temperature As with water, so with temperature. The degree of the latter influences the result aimed at: adversely or favorably, as may be. For as heat accelerates chemical action and cold retards it, a simple study of the phenomena of development should tell the reader that it is dangerous to play tricks with the temperature of his developing and other solutions. They should be maintained as nearly

as possible at from 60° to 65° Fahr., all the year round. As the temperature is allowed to fall, development is correspondingly slowed: with the consequent risk of the underdevelopment of the image. Above 65° Fahr., flatness of image and fog are courted, as rapidity of developing action is hastened and the surface of the silver salt is reduced before the lower layers are attacked. Imperfect fixation results if the hypo bath is used too cold: silver hyposulphite and sodium hyposulphite being left in the film to menace the permanency of the image, which will be simply dissolved away in time. Meanwhile, the salts thus left in the negative crystallize out on the surface and stain paper placed in contact with it. The remedy is to refix the negative in a fresh bath of hypo, which will remove these superfluous crystals and leave a clear image, which will probably need intensification. And all this because the original fixing solution was too cold. Verily, the way of the photographic transgressor is hard.

Fog

The partial or complete veiling of the picture in development, tersely called fog, is easily first on the list of our defects by reason of its frequency and generality. Every photographer encounters it, sooner or later. It proceeds from many causes, any one of which will produce the defect in either a mild or an aggravated form. Generally it is referable to extraneous light action, i. e., light which does not pass through the lens to form the image; or unsuitable development. We give a list of possible causes, each one of which suggests its own preventive. (1) camera admits light, (2) plate-holder leaks at the corners or hinges, (3) holder does not fit the camera, (4) light is reflected from the lens onto bright parts inside the camera, (5) plate-holders were too freely exposed to bright light, (6) over-exposure, (7) unsafe dark-room light, (8) prolonged development, (9) the use of too strong an accelerator. Fog from these causes is usually spread over the entire surface of the negative and not locally confined. It is difficult to treat it remedially with success; but if the negative is carefully reduced to clear off the surface veil, the image can be intensified up to proper printing density. *To reduce:*

Treat with clean hypo solution (as used for fixing), 1 fluid ounce; potassium ferridcyanide solution (40 grains to the ounce), a few drops, just enough to make a pale yellow solution. Immerse the fogged negative in this solution; the veil will gradually dissolve away, due to the hypo attacking the ferridcyanide of silver formed on the surface; then, when the negative looks clear and bright, and has been well washed, it may be intensified up to the necessary density. *To intensify:* Make a solution of mercuric chloride, 300 grains in 10 ounces of water, and add ½ dram of hydrochloric acid. Bleach in this solution and blacken in a solution of strong ammonia water, 20 drops; water one ounce.

Uneven Density

Allied to fog, in the eccentricity of its incidence, is the defect known as uneven density: that is, the reduced silver appears in irregular patches of varying thicknesses. A thin end, side, or corner of a negative may be caused by the unevenness of the sensitive emulsion; patches of less density may be due to the quantity of the developer used being too small; or by the dish not being properly level; or by carelessness in pouring on the developer, the thinner parts being places which were only partly covered by the developer and therefore less reduced. The solution acts in uneven waves and gives different degrees of density, so that the parts which the solution has not touched will be clear gelatine and the other parts will be more or less opaque. To remedy this defect of uneven density is out of the question; to prevent it, use a sufficient quantity of developing solution, rock the dish steadily and see that all parts of the plate, or film, are simultaneously covered by it.

So far, the defects referred to have been general in their nature. Introductory generalities serve, as a rule, the good office of indicating comprehensively familiar pitfalls and how to avoid them. This is the raison d'être of the previous paragraphs. We now wish to be more precise in our definitions, so that the reader will have greater cause to bless and thank us by the time he reaches the last page. The way to good negative making frequently lies through failures and a careful study of their causes.

The Everlasting Don't

For the —nth time, in the career of photographic mentorship that has been assigned us by Providence, we are tempted to tell the neophyte, for whom we are writing these pages, that prevention is better than cure and cheaper, and then address ourselves to an enlargement on that text. But exigencies of space (time-honored phrase!) oblige us to be content with the simple quotation and no more. It is a fact, however, that most of the defects to which negatives are liable can be prevented by applying a series of simple do's and dont's in the course of the work. The dont's count for as much as the do's, and the neglect of them lurks at the root of most of our subsequent troubles in negative-making. Good negatives result only from a rigid adherence to rule—like everything else that is good—and not Rules of Thumb, but Scientific Rules. Expose by rule, develop, wash, fix, dry by rule, and never break any one of the rules, and neither defects nor failures need be feared. Gentle reader, lay yourself out to treat the sensitive film in all its manipulations, from unpacking to drying, as if it were a thing of such tenderness that it can be handled only with the most perfect delicacy and care, protect it from dust, damp, dirt dangerous light, and deleteriousness of developing, and all other solutions, and there will be no obstacles in the path of your success. If any obstacles arise, be sure they owe their presence to the neglect of some do or don't, in accordance with the details and particulars set forth in the following paragraphs:

The Perfect Negative

It is clearly impossible in a monograph of this nature to shirk the responsibility of telling the reader what it is he starts out, in theory, to make when he gives his exposure. It is, of course, a perfect negative—the oft-quoted image of pure silver in clean gelatine, which reproduces all the light values and gradations of the original subject. Sir William Abney, in the first edition of his classical *Instructions*, termed development "an art and a science," and the definition was long meekly accepted by the thoughtless and the ignorant until Hurter and Driffield, Watkins and others, came along

to demonstrate that there was no art about the matter at all, but that the whole thing was an affair of scientific method and calculation—only that and nothing more. The destruction of all art pretentiousness and the inculcation of the right and proper scientific aspect of the thing should, *a priori*, make the turning out of perfect negatives, in these days, as easy as shelling peas. If, however, the exposure has not been accurately timed, the very foundation of our ideal has been badly laid and the developing solution will not have been on our film more than thirty or forty seconds before we must make up our minds that our negative is suffering from some form of original sin which will ultimately develop into a more or less remediable defect.

Hard Negatives

The classification of negatives that are defective, therefore, resolves itself into a simple matter. Experience shows that they are, primarily, either hard or thin, and that the exact measure of their defectiveness can be ruled off into degrees and the remedial treatment adjusted accordingly. To take hard negatives first. *Slight hardness* is probably caused by prolonged development of a correct exposure. Remedy: slight reduction in a 10-grain solution of ammonium persulphate (10 grains to each ounce of water). Soak the negative for about ten minutes in plain water, and then place in the reducer. Examine from time to time, and repeat the operation by rocking in the reducer until the proper density is reached. This method softens the scale of deposit in the negative: a result of a harder character is obtained by using the ferridcyanide reducer already quoted. Wash well after reduction. *Great hardness* with dense high lights and no shadow-detail proceeds from under-exposure and over-development. Remedy: the persulphate reducer; or a redevelopment process may be tried. Bleach the negative in potassium bichromate, 100 grains; nitric acid, 1 dram; potassium bromide, 50 grains; water, 10 ounces. The yellowish white negative should be next placed in a solution of sodium sulphite, 20 grains to each ounce of water, until the yellowness has disappeared; well washed and then redeveloped in: glycin, 4 grains; sodium sulphite, 12 grains; potassium car-

bonate, 20 grains; water, 1 ounce. If carefully done, the redevelopment will give a negative that may, if desired, be further strengthened by intensification. *Excessive density* all over the image is caused by overexposure and prolonged development. Remedy: reduction with ferridcyanide and hypo and intensification (if needed) with mercury and ammonia as already described or mercuric iodide, as may be preferred. For this latter dissolve 40 grains anhydrous sodium sulphite in 1 ounce of water, and, when quite dissolved, add 4 grains mercuric iodide. Immerse the negative in this solution until the desired degree of intensification is reached, after which wash for a few minutes in running water. If the brown color of the image is undesirable it may be turned to black by redevelopment in any ordinary developer without further addition of intensification.

Thin Negatives

Thinness of image, with plenty of detail, is possibly caused by (1) underdevelopment, (2) an exhausted developer, (3) low temperature of the developing solution. The preventives of Nos. 2 and 3 will be obvious; the remedy for the thin image is intensification by any favorite method. *Thinness of image without detail* is due to underexposure. Remedy: intensification, preferably with uranium, which builds up a negative of this character more readily than mercury, which requires a greater deposit of silver to work on. Uranium nitrate, 80 grains; potassium ferridcyanide, 80 grains; acetic acid, ½ ounce; water, 20 ounces. The negative becomes reddish brown in this solution due to a deposit of uranium on the silver image. An advantage of this method is that the intensification may be dissolved off by any alkaline solution and the process repeated. *Thin negatives that have detail and are veiled all over* are caused by overexposure and brief development. Remedy: reduce with ferridcyanide and hypo and intensify with mercuric iodide as already described.

Drying Marks

When the negative, if it be a plate, is reared up on end to dry, or in the case of a film, suspended by a clip to a string, it is not immune from trouble. If water be left upon it in uneven patches, drying marks will be visible when all

the moisture has evaporated. To prevent this, the excess of water should be well drained from the surface before the negative is set to dry. Dust in the air is likely to settle on the film, if the latter be not turned toward the wall. Prolonged drying also causes markings; hence the temperature of the room should not be allowed to decrease to such an extent that the moisture in the film finds a difficulty in disappearing. These marks are sometimes so pronounced that they show in the print. To remedy them: Resoaking in water to swell the film slightly and then drying in an evenly moist state. A hardened film often stands the application of a squeegee for driving off superfluous moisture; this dodge is not to be attempted by the clumsy-handed, the inexpert or the nervous worker. A tuft of clean absorbent cotton, well wetted and then squeezed dry, applied in even strokes from end to end of the film will remove all surface water, and is a safer expedient than the squeegee.

Halation

The partial blurring, or obliteration of the photgraphic image, called halation, is present, more or less, in many negatives. Light, in its passage through the sensitive film, spreads laterally and in proportion to its intensity so is the spreading action made apparent. The back of the celluloid film, or glass plate, being also a true reflecting surface, a certain proportion of the light is returned towards the sensitive slide. The effect of this irradiation manifests itself by dark fringes round brightly lighted parts of the negative, outlines of windows, buildings, etc., encroaching on the adjoining shadows. In other words, the light parts of the image spread over into the dark parts. The print shows a blur in the halated parts, as owing to what is virtually an excessive reduction of silver by over-exposure, that being what halation practically is, it does not print in proper order. Preventives of halation are: (1) The use of thickly coated plates or films, which diminishes translucency. (2) The application of a backing mixture in optical contact with the plain side of the film or plate. Backing mixtures are sold by dealers; they often consist of caramel, a thick, viscous liquid, which is coated on the glass side of the plate with a pad of felt or similar soft substance, before

being placed in the holder. Do this in the dark-room, of course. A palliative remedy for halation is the careful reduction of the excessively lighted parts of the negative. Immerse the latter in a solution so composed: Chromic acid, 30 grains; potassium bromide, 60 grains; water, 10 ounces. This will bleach the image. Well wash and redevelop in any clean working developer, such as amidol or glycin, but before the halated parts have darkened place the negative in the fixing bath, which will dissolve out the non-reduced or halated parts, or the process may be used as a purely local one; that is, the halated parts alone bleached, redeveloped and fixed out. Considerable care and judgment are obviously called for. The rare occurrence of halation with films is one of the advantages possessed by films over plates, although it is by no means impossible to get halation when films are used.

Developer Stains

Stains on negatives vary in color with the developer used. *Pyro* gives a more or less pronounced brown or yellow stain if impure sodium sulphite be used; the developing solution be stale or oxidized; or too much bromide or insufficient sulphite is used. The stain is removable by (1) immersion in a 2 per cent solution of ammonium persulphate. So soon as cleared, transfer the negative to a 10 per cent solution of sodium sulphite and wash. (2) Perchloride of iron, 30 grains; citric acid, 60 grains; water, 13 ounces. At the proper stage, stop reduction by immersing the plate in water. (3) Sulphate of iron, 3 ounces; sulphuric acid, 1 ounce; water, 3 ounces. Wash in plain water to stop the action of this solution. (4) Saturated solution of hypo and an equal quantity of glycerine. This is suggested for reducing very deep stains by immersion for many hours. *Hydrokinone stains* are dealt with by first bleaching the image in: potassium bichromate, ½ ounce; water, 25 ounces; hydrochloric acid, ¼ ounce. This gives a pale yellow stain, due to the bichromate, which must be washed out and the image redeveloped with ortol or metol. *Amidol* stains are removed by washing soda, 50 grains; bicarbonate of soda, 4 grains; chloride of lime, 10 grains; water, 1 ounce. Half an hour's washing

after the stain has been removed completes the process. (5) A clearing bath for all developer stains is: alum, 1 ounce; citric acid, 1 ounce; ferrous sulphate, 3 ounces; water, 20 ounces. This will remove scum-like markings seen on negatives, which are caused by the developer being frothy and not flowing evenly over the surface of the gelatine which is sometimes repellent.

Silver Stains The cause of silver stains on negatives is mostly traceable to the improper use of printing-out paper. Either it or the negative was damp in the printing; the result being that some of the free silver in the paper was reduced on the negative in the form of metallic silver. The removal of such a stain is difficult, but may be attempted in various ways. (1) Soak the negative in an alcoholic solution of iodine (about 10 grains per ounce) until the stains become yellow and almost invisible; then place the plate in a clean hypo fixing bath, which will dissolve out the iodide of silver formed. (2) Take sodium hyposulphite, 2 ounces; sodium phosphate, 5 grains; lead nitrate, ¼ ounce. Dissolve in 6 ounces of water, add ¼ ounce of alum and stand the solution aside to clear. After treatment, the negative must be well washed. (3) If varnished, the varnish must be removed with alcohol, accompanied by rubbing with absorbent cotton, afterward drying the surface of the negative with a soft, clean cloth. The surface of the stain should be then rubbed with finely powdered pumice stone or cuttle-fish powder. When the surface of the stain has been removed, place the negative in a *freshly made* solution of hypo. A recent stain may go in a few minutes; an old one may take some hours. If the stains, be they of silver, or any other substance, with which the negative has come into contact, are simply on the varnish with which it is protected, they will probably not penetrate to the image. The varnish can be removed with alcohol and a pledget of absorbent cotton and the negative revarnished. Varnish it is a good preventive of stains.

Packing Stains Negatives kept in paper envelopes, according to Dr. Hauberisser, sometimes show spots and marks on the film, due to action by the paste used in making the envelopes.

He advises bleaching the negative in acidified bichromate. It is then washed, redeveloped, washed and dried, and the stains will disappear. The bleaching solution recommended is: Potassium bichromate (10 per cent solution), 40 minims; water, 1 ounce; hydrochloric acid, 10 minims. This acts in the way already described.

Surface Stains Amongst these we enumerate (1) surface fog, or stains from prolonged or forced development; a combination of general dirtiness and discoloration, the surface being dirty and degraded instead of being bright and clean. (2) Small patches with a rainbow effect of color by reflected light, or a brown stain. This is caused by scum on the developing solution. (3) Iridescent markings round the edges of the negative, brown in color by transmitted light, caused by stale plates or improper keeping. These stains are removable in a bath of sodium hyposulphite, ½ ounce; water, 5 ounces; potassium ferridcyanide, 2 grains.

Ferridcyanide Stains In using the ferridcyanide and hypo reducer, yellow stains sometimes appear on the denser parts of the image. To remove: First remove all the hypo by prolonged washing and immerse the negative in nitric acid, 30 minims; alum, 30 grains; water 10 ounces. Other methods are, (1) immersion of the well-washed negative in a 10 per cent solution of sodium sulphite. (2) Solution of ammonium sulphocyanide, 5 grains to each ounce of water.

Ferro-prussiate Stains In blue-printing, if the paper is allowed to get damp, blue spots will appear on the negative. To remove them place the negative in a 10 per cent solution of ammonia until the blue stains are changed to brown ones, wash thoroughly and remove the brown stains by immersion in a 10 per cent solution of oxalic acid (poison). Wash the negative well again.

Platinum Stains In printing on platinum paper, a necessary condition is that perfect dryness should prevail all through the operations. The presence of dampness, especially if the negative be unvarnished, may cause the reduction of some of the platinum salt on the film in the shape of

spots; iron, too, may be present. The stains may succumb to treatment with dilute hydrochloric acid; a more drastic remedy is a mixture of nitric and hydrochloric acids (*aqua regia*) which is a specific solvent of metallic platinum. But this powerful re-agent must be very carefully applied to the platinum spots, as it is capable of dissolving away silver, gelatine and all. At best these remedies are last resorts, only to be adopted with extreme caution and judgment.

Stain Removal Systematized

In 1903, R. E. Blake Smith published, in "Photography," a valuable paper which examined the causes of stains on negatives and considered the best means of removing them by systematized chemical agency. Mr. Blake Smith arrived at the conclusion that all developer stains can be bleached out by the use of an acid or alkaline bleaching powder solution. He gives a list of the commonest stains on negatives, their causes and the suggested remedies for them. The writer very properly points out that it is always better and quite easy to take precautions against getting any developer stains on one's negatives. Plenty of a soluble sulphite should be used in the developer itself, and after development the plate should be washed at first in a solution of sodium sulphite, or directly fixed in the bisulphite hypo bath — the "acid" bath. When the time comes for drying the negative it should be put up to dry in some place where there is no chance of it being splashed with injurious solutions. Still, owing to an occasional lapse into careless ways, one may get every now and then an unevenly stained negative. It will be observed that, in the following table, stains due to imperfect fixation and washing are mentioned and remedies suggested for them. In our experience the causes of discolored negatives are too commonly ascribed to the developer and not to the unsuspected fixing bath or washing water. This point is worth noting by the troubled amateur.

Nature of Stain.	Causes of Stain.	Remedies.
Oxidized developer stains	Carelesseness in various ways on part of the operator—using too little sulphite in the developer, or not taking enough care in subsequent operations.	Various hypochlorite and hypobromite solutions alkaline and acid. Solutions of chlorine, bromine, or less valuable iodine. More rarely sulphurous acid. Bleaching powder is the most convenient source of hypochlorite solutions.
Silver stains.	Bad plates. Printing from bad P. O. P. Using an unsuitable developer. Putting negatives of certain brands developed with hydroquinone into fixing without sufficient washing.	Density reducing solutions, as Howard Farmer's. The stain can only be removed if it is near the surface of the film.
Brown stains in mercurial intensification.	Precipitation of CO_2 $4HgO$ from washing a film containing mercuric chloride in tap water. The mercuric chloride solution should always contain about one per cent of hydrochloric acid, and the first two wash waters after the mercury bath should consist of half to one per cent hydrochloric acid.	A two per cent solution of hydrochloric acid. Remember that $HgCl_2$ solution hardens the gelatine film, so that acid of this strength is quite safe to use.
Yellow ferrous oxalate stains.	Precipitation of iron-stained calcium oxalate brought about by washing too soon in tap water unacidified.	These stains can be prevented by washing in half per cent acetic acid at first. If the stains, however, are once formed, a stronger acid solution is necessary. In this case, first harden the film with formalin and then treat with three per cent hydrochloric acid.
Sulphur stains.	Those appearing after the negative has been dried and put away, are due to incomplete fixing or washing, or both. If the fixing has not been complete, the stain deposit will probably contain silver sulphide. An immediate deposition of sulphur is caused by putting a plate whose film contains "hypo" into an alum or acid solution.	When these stains are produced only by sulphur they can be removed, I find, by alkaline sulphides. The alkaline sulphides dissolve the sulphur forming polysulphides. If, during this treatment, any part of the silver image gets converted into Ag_2S, the whole of the image can afterwards be chlorinated with the bleach solution and then redeveloped, or the whole sulphuretted.

Frilling When the edges of the film begin to pucker up at the sides and seem inclined to leave the support, the worker is face to face with an old terror of the dark-room, viz., frilling. This happens more frequently in hot weather than in cold, and may be due to the solutions being too warm or of differing temperatures. The removal of the negative from a developing solution at 65° Fahr. and placing it in hypo solution at 50° Fahr. will often produce it. Excess of alkali in the developer also causes frilling; so does prolonged washing in hot weather. The removal of these causes will prevent the defect and so will an even temperature of 60° to 65° Fahr. Films known to be liable to frill may be hardened in a preliminary bath of alum, chrome alum, or formalin. Nowadays, plates or films seldom frill so badly as to leave the support. The partially frilled film may be easily smoothed back into its proper position, whilst it is in a softened state, by careful touching with the forefinger; it will adhere to the glass or celluloid when dry.

Bubbles Air-bubbles forming on the surface of the film during development prevent the developer acting there. They are caused by a stale or oxidized developer or the uneven flowing of the solution, and cause transparent spots in the part of the film which they cover. They vary in size from a pin-point to one-fourth inch in diameter. One form of the defect, and a common one, is a cloud of small spots of irregular shapes running in lines or waves, caused by a stale developer; or if the solution stands some time in the graduate before use; or if it is used for several plates or films. The irregular shape of the spots is caused by the bubbles changing their formation in development. Larger bubbles, of circular form, attach themselves to the film during development, frequently at the edges of the negative; sometimes they have opaque centers or nuclei, which are spots of unfixed silver bromide. This is due to the fact that the developer did not reach the film where the air-bubbles formed, the gelatine was not softened and so the action of the hypo-fixing bath is slower there. These spots render the negatives practically useless. To prevent them, keep the developer

fresh and clear, pour it gently into the dish, rock the latter gently and regularly, and, if air-bubbles are seen to be forming, take a camel-hair brush and draw it over the plate or film in the dish so as to break up the bubbles immediately they appear.

Mottling; Reticulation

Mottled appearance in the sky or on a plain background in the negative may be caused by insufficiently rocking the developing solution. Crape marking or reticulation of the film is a partial softening of the gelatine caused, chiefly, by too much or too little washing; partial drying before final washing; or uneven temperature of the solutions. The film puckers up into a regular pattern on its surface. Such markings cannot be eradicated. The preventive is even temperature of the solutions and care in applying them. The use of an alum bath to harden the film sometimes converts it into the consistency of leather, with surface patches or streaks. The alum bath, as a preventive of frilling, should be used only between development and fixation and the film well washed after each operation. Crape-like markings and excessive relief of the film are caused by the careless drying of negatives in front of a fire. There is no remedy for this defect. The rapid drying of glass negatives in alcohol frequently leaves an opalescent scum on negatives. The remedy for this is the use of a clearing bath made by acidifying a saturated solution of alum with a few drops of acetic acid.

Fixation Troubles

When hyposulphite of sodium is dissolved in water the chemical action sets up a distinct lowering of the temperature. So that if a newly developed plate be placed in a freshly made fixing bath, frilling will possibly arise or the unaltered salt will not be completely fixed out and opalescent stains will be deposited on the negative. Crystalline deposits on the surface of a finished negative indicate imperfect fixation: remedy, re-fixation. Sometimes the negative exhibits distinct traces of a yellowish white deposit in the film. Same cause and same remedy—the difference between one defect and the other is that in the first case the hypo was not washed out of the film after the fixation; in the other, that the

negative was apparently perfectly fixed. Apparent and actual fixation are two different things. After the picture is perfectly clear to the eye it is a good thing to allow the fixing solution to act a few minutes longer. Imperfect washing is only one degree less dangerous than incomplete fixation: for the absorbent property of gelatine requires an appreciable length of time for the water to extract the soluble hyposulphite from it. An exhausted fixing bath is slow in action and inevitably leaves silver and sodium salts in the film. Remedy: the preparation of a fresh bath of proper strength. An old fixing bath contaminated with developer will stain the film, which will require treatment with a clearing solution. Hyposulphite of sodium frequently contains many minute impurities which may cause spots on the film. To prevent: filter the hypo solution when it is made up. This is a refinement of practice that in our experience has often caused a smile; but it is worth it. Of the many minutiæ that make for success, it is one. Success in photography is the result of close attention to the little things of procedure. Sometimes after the re-fixation of an imperfectly fixed plate the negative is still badly marked. It is recommended to attack these markings by treating the negative first in a bath of: Formalin, 1 ounce; water, 10 ounces; and then placing it in water at a temperature of 80° to 90° Fahr.; changing the water several times and finally standing the negative up to dry spontaneously.

Intensification Defects

A not uncommon defect with mercurial intensification is over-density; the negative has been made too thick by the corrective process. Remedy: removal of the intensification, which can be done by immersing the negative in the hypo fixing bath. It is sometimes required to remove the uranium intensifier for the same reason. Remedy: Immersion of the negative in a weak alkaline bath, made by adding a few drops of strong ammonia to an ounce of water, or by dissolving about 30 grains of sodium carbonate in a similar quantity of water. The uranium deposit is dissolved away in a solution of this character. To re-intensify, wash the negative and immerse in another solution of water distinctly acidified with

acetic acid. Strains that appear after either of these processes of intensifications are probably due to imperfect fixation. Remedy: removal of the intensifier and refixation may succeed, but if, as probable, the stains are a brownish yellow color, the stains are irremovable without destroying the negative.

Dust

Many years ago one of us was an object of derision on account of the appearance in a journal, of which we then had charge, of a number of articles treating of the apparently slight subject of "Dust." One of our critics, who has himself since become the editor of a photographic publication, ironically presented us with a book about "Dust," with an amusing autographic dedication. But time has vindicated us and both our confrere and ourselves find today, as we found fifteen or sixteen years ago, that dust is one of the most insidious enemies the photographer can have and is, at all times, to be guarded against. The camera, the plate-holder, the dark-room, the printing-room have always to be kept free of dust, otherwise spots and pinholes on the negative will surely result. We know some photographers who are so zealous in this respect that every morning, before commencing work, the dark-room is dampened and swept so that no particles of dust may arise in the course of the work. Roll films in use offer little shelter for dust particles if the camera be cleanly dusted, but plates used in holders supply an easier target. Always, then, carefully dust camera and holder before filling the latter and see that the dark-room and the developing utensils are kept equally clean. Spots on plates have been traced to dust proceeding from portions of developer dropped on the floor, the solid particles being trodden about and lifted into the atmosphere to settle on the film. An additional refinement of practice is to filter all solutions used in photography so as to get rid of "this matter in a wrong place," which has such evil potentialities in negative-making.

To dust we can trace almost half the little defects observable in the amateur's film negatives, especially when the work has been done out-of-doors. A single bit of sand or grit in the roll or spool chamber, or in the film

pack, will produce long, thin scratches on the exposed film, most difficult to remedy or remove. Similarly dust on the film in the camera will cause transparent spots of the most exasperating sort, requiring much careful spotting before printing. For this reason users of roll films, or film packs, should be careful to keep their supply of films scrupulously protected from dust when working outdoors, along the country road on a cycling trip, or at the seashore.

Pinholes Caused by dust on the plates during exposure; the unexposed parts fixing out and leaving clear glass—hence the name, pinhole. To remedy: take a camel-hair brush, giving a fine point, and a little Indian ink. Place the negative in a sloping position, film side towards you. Dip the brush in the Indian ink and with a steady hand put the point of the brush on the pinhole. Fill it with one straight touch. Other causes also contribute to the production of pinholes; they may be summarized in the one word "dust." Particles of dust in the camera, the plate-holder, the dark-room, are just so many enemies, whose exclusion from the sensitive film is only to be assured by scrupulous cleanliness throughout all the work. The necessity for this is too obvious to be insisted upon at greater length. A developing solution strongly charged with gaseous bodies—full of small bubbles, in fact—will sometimes deposit minute bubbles on the film. These resist the action of the developer and fix out clearly. We once traced a crop of these to the use of tap-water that came in at an exceedingly high pressure. When we reduced the pressure we had no more trouble from pinholes.

Colored Fog A negative that looks green by reflected light, and pink or red by transmitted light, is said to be afflicted with dichroic fog. The cause of it has never been accurately determined; it is probably due to forced development with ammonia or ammonium carbonate in the solution. To remove: immerse the negative in ferric chloride, 50 grains; potassium bromide, 30 grains; distilled water, 4 ounces. If reduction proceeds too far re-development should be resorted to. Gentle rubbing with absorbent

cotton, moistened with alcohol, may reduce the coloration. Another suggested remedy is the immersion of the negative in a solution of permanganate of potash, half a grain to the ounce of water; rinsing; and refixing in an acid sulphite fixing bath. This is said to remove the fog without affecting the image. "Silver fog," which, by transmitted light, is of a reddish yellow color, and by reflected light, a greenish blue silver color, has been traced to the use of an exhausted fixing bath made up with a preservative, the bath being too weak to dissolve out the unaltered salt and so leaving the negative imperfectly fixed. The use of a freshly prepared hypo solution obviates this defect.

Bacterial or Fungoid Growths

The keeping of the unexposed or undeveloped film for any length of time in a damp atmosphere is attended by a special risk, which sometimes results in unpleasant manifestations. Minute organisms are likely to form in the gelatine and lead to whole colonies of cultures, so that distinct bacterial traces are formed either in the film itself or fungoid growths are visible on its surface. These will fog the image locally. There is practically no remedy for them; they may be prevented by the proper storage of the film in a cool, dry place. Similar bacteriological troubles have been known to arise in negatives improperly stored. The fading of the developed image is a phenomenon also not unknown to experienced workers. High scientific authority has asserted that the deposited silver volatilizes, if the atmosphere be vitiated, and instances have been quoted where the finer details of the picture have been lost through this alleged cause. No remedy here, of course; but the moral is that the finished negative, if it be valued, should be stored in pure, dry surroundings.

Thumb Marks

The conversion of one's fingers into thumbs in dark-room work is a proceeding fraught with danger to the purity of the film which is liable to be stained with any chemicals that are in contact with the fingers. The markings are removable (1) by rubbing the dry surface with a pad of soft, clean flannel moistened with benzole, or a piece of chamois leather stretched over the finger and moist-

ened in the same way. Gentle friction should be exercised. The importance of care and cleanliness in handling the chemicals is very great; the sensitive film being a tender product and liable to degradation from an infinity of causes, which are easily preventible by care and cleanliness. We hope the reader does not tire of this text; trivial though it may look, it is of such importance in photographic manipulations that its repetition is always excusable.

Printing from Defective Negatives

The printing process can be adapted to defective negatives. (1) Hard negatives which give chalky results on printing-out papers if printed in the sun will have the glaring contrasts toned down. (2) By using matt or rough-surface gaslight paper and holding the negative near to the gas flame the contrasts will be subdued. (3) Using special papers prepared for hard negatives. Negatives which are full of detail, but are thin through under-development, and negatives which have been under-exposed and lack detail produce flat prints with little contrast; but may be made to yield more contrasty prints. (1) By printing them in a very weak light, say at the back of a room, so that they take a day or more to print. (2) Printing them under yellow glass, which holds back the darker parts of the negative, while the thinner parts print through. (3) By using gaslight papers made to give contrasty prints and holding the negative a good distance from the frame.

Printed Matter on Negatives

The wrapping of the finished negative in paper is attended by many risks, especially if newspaper be used for the purpose. The printed matter, if dampness be present in the atmosphere, the paper or the negative, is liable to set off and an impression be made on the gelatine of the image. This applies to undeveloped films or plates or films. The impression consists of fatty ink, chiefly of carbonaceous matter. To destroy the impression is no easy matter and a reliable remedy hard to suggest; but the use of a solution of a mineral acid, such as citric, hydrochloric, or nitric, may be recommended for trial. Five grains of the first named, and five minims of the others per ounce of water, will form sufficiently

strong solutions, which should be rubbed on by means of a tuft of absorbent cotton. Packing the undeveloped plates, face to face, in clean, dry tissue paper will prevent surface markings and general fog arising from impurities which exist in many papers.

Optical Defects

Optical defects in negatives are, in most cases, irremediable, except by the plan of making fresh negatives. General lack of fine definition may be due to (1) incorrect focusing; (2) the use of too large a stop; (3) dirt or moisture on the lens; (4) noncoincidence of the sensitive surface with the focal plane; (5) shaking of the camera during exposure; (6) haze or mist between the lens and the image. It has been suggested that if an enlargement be made from the negative and the picture be re-photographed down to the original scale, a sharp image will be obtained; but in practice this is not so. Marginal or foreground distortion, due to the use of a lens too short in focal length, cannot be remedied; but marginal convergence or divergence of perpendicular lines, due to the use of a single lens held too close to a building having upright lines, can be cured by copying a print from the negative, the plane of the print being inclined at an angle with the lens so that its distortion is compensated for in the negative. Briefly, one form of distortion is cured or nullified by the introduction of its opposite form. A dense, central portion of the negative with thin edges all around is probably due to an insufficient covering power of the lens.

Scratches in Negatives

The life of the negative is constantly menaced by breakage, either of the film or its support. Glass is a brittle substance and is consequently liable to breakages, partial or complete. The breakage, when it occurs, may seem irremediable, but seldom is. First, as to glass negatives. Sometimes, when the negative has been developed and dried, scratches on the glass sides are seen. These, if neglected, will print through and mar the image. The scratches should be stopped out with a transparent substance. This can be done by cleaning the scratches and filling them up with Canada balsam, thinned down with benzole. The Canada balsam is to be had at any

drug-store. When the balsam has dried, the negative should print through as usual, without markings. A negative that is broken only in the glass, whilst the film remains intact, is not beyond immediate use if great care be used in handling it. It will give an unmarked contact-print if dealt with in the following manner: Place it in the frame in contact with the paper, as usual, and then choose a wooden box some two or three feet deep and lay the printing-frame at the bottom of it, with the glass side of the negative pointing up to the sky. This is using a vertical light for printing and, if carefully done as directed, the breakage of the glass will not show through on to the paper. Another way of printing from a cracked negative, that is recommended, is by the insertion of a piece of good tissue paper, between the face of the negative and a piece of clean glass plate the size of the negative, then binding the two together with strips of gummed paper. If the negative is broken in several pieces, one way to mend it is by mounting the pieces upon clean glass, fitting them accurately together and exposing for a positive. Retouching the positive will remove the marks; after which a negative can be made from it.

Cracked Negatives

But the defect being of common occurrence, some more effective method of remedying is required. The glass of the plate may have been cracked before exposure and development. To detach the film from the broken support, one plan is to soak the negative for twenty-four hours in a cold saturated solution of washing soda. This will soften the film, which can be peeled off the glass untorn. Then soak for two or three hours in plain water. This expands the film. To reduce to the original size, soak in a bath of alcohol, which will reduce the film to the original size and toughen it. Then transfer to a clean glass plate to which it should adhere. A fine line in the negative may still exist, due to the glass having been cracked before development; this mark can be touched out on the print. Another plan is to prepare the following solutions: (1) Fluoride of sodium, ½ ounce; water, 16 ounces; cork the bottle and shake well. (2) Powdered citric acid, 1 ounce; water, 16 ounces; cork and shake

well. Have at hand a clean glass plate larger than the negative, in a tray of clean cold water. If a half-plate negative is being stripped, a 5x7 dish and sheet of glass are necessary. To strip the film take 4 ounces of No. 1 solution in a tray of hard rubber (which is impermeable to compounds of hydrofluoric acid formed in the mixture); then add 4 ounces of No. 2. Rock the mixture, then immerse the negative, film side uppermost, rock the tray endwise and crosswise, allow to stand for half a minute then rock again. The film will slightly frill at the edges; with the forefinger and thumb of each hand lift the film clean off the cracked support, place in the water above the clean glass plate, lift the plate by the two top corners and adjust the film so as to leave a clean margin all round. Lift the plate and film together and drain. Lay the plate in a horizontal position and adjust the film so that there are no air-bubbles. After draining, allow the transferred film to remain in a horizontal position to dry. In place of the sodium fluoride mixture, formalin is used by some workers. Solution A: Caustic soda, ten per cent solution, ½ ounce; formalin solution, ¼ ounce; water, 5 ounces. Solution B: Hydrochloric acid, C. P., 1 drachm; water, 8 ounces. By this method, if the negative is varnished or retouched, the coating should be rubbed off with alcohol or turpentine. Soak the film in plain water to soften it, but before this, with a knife and a safe edge, scratch a line through the film to the glass, around the four sides of the negative, close to the edges. This will facilitate stripping. After soaking in water for half an hour, immerse plate in solution A for five minutes, rinse and transfer to solution B for five minutes. Rinse well and place on table, face up, ready for stripping. Dampen a clean sheet of writing-paper large enough to lap over the plate all around, lay this on the film and cover with a blotter. Take a knife and start a corner of the film by gently lifting it up with the finger. A gelatine-coated plate should be ready. To prepare the coating, soak 1 ounce of gelatine in 16 ounces of water until softened, then dissolve by heat. Then add chrome alum, 20 grains, dissolved in 1 ounce of warm water, add gradually to the gelatine solution, stirring to prevent precipitation. The glass plate

should be immersed in this solution while warm and then drained and dried. Lower the film into position on the new support and rub into contact under a blotter. Remove the paper and dab out any bubbles that may remain between the films.

Damaged Film Negatives

Rollable film negatives, when ready for printing or enlarging, may be so torn, doubled or creased, that the markings will show through on to the paper. A new support can be improvised by taking an unexposed rollable film, fixing out the silver salt in hypo solution and drying the plain gelatino-celluloid film. Have at hand a sheet of glass, slightly larger than the negative, a flat squeegee and a bottle of the following solution: Alcohol, 10 ounces; water, 10 ounces; glycerine, ½ ounce; ammonia, 10 minims. Soak the damaged negative for fifteen minutes in clean water. Then hold the softened negative, face toward you, in the left hand, and with the right thumb and forefinger peel the negative off the support and place it in a dish of the above solution for five minutes. Soak the new base in clean water for a few minutes and then place it, gelatine side up, on the sheet of glass. Withdraw the negative from the alcohol bath and place it on the film as it lies on the slab, spread it out evenly and then turn it over so that the face of the negative is on the glass, with the celluloid support uppermost. Carefully squeegee out the superfluous moisture with two or three steady strokes. After a few minutes, the film may be peeled off the glass diagonally and the newly backed-up negative pinned up, face upward, to dry.

Storage of Plates and Films

If plates and films are not stored in a cool, dry, light-tight place they are liable to deteriorate and so yield foggy results. The fumes of sulphur, so constantly present in the atmosphere of the dwelling house, are a source of danger; so, too, are the emanations from illuminating gas. The plates and films may be rendered unusable by these deleterious agencies. On development, they will yield either foggy images or iridescent stains. The remedy is obviously a preventive one as indicated in the first line of this paragraph. In our experience, many a mysterious case of fog and surface

marking has been traced to the improper storage of plates and films. Vitiated atmospheric air readily tarnishes articles of metallic silver and so forth, and it can be imagined how insidiously it will attack the highly sensitive layer of a film or dry plate.

Conclusion Most, if not all, the normal defects met with in plain negative-making have been dealt with in the foregoing pages. The subject, kept within the limits we assigned ourselves, is merely a section of the much larger main theme, viz., the after-treatment of negatives, upon which several exhaustive compilations have been founded. But here we have deliberately taken the case of an intelligent amateur and watched, as it were, his progress along the path of straightforward negative-making, conceiving for our course of remedial suggestions, the troubles he is most liable to create for himself, in ordinary every-day work.

BOOKS

Finishing the Negative. A concise handbook to all the processes between development and printing. By H. Snowden Ward. 1907. Paper, 50 cents.

The Perfect Negative. A series of chapters on the after-treatment of the negative. By F. C. Lambert. 1899. 50 cents.

Intensification and Reduction. The various methods described and explained, with formulæ. By H. W. Bennett. 50 cents.

Notes and Comment

Will readers please note that from this time forward the editorial and publishing offices of Messrs. Tennant and Ward, THE PHOTO-MINIATURE and "The American Annual of Photography," will be located at

122-124 EAST 25TH STREET, NEW YORK

from which offices the American editions of "Photograms of the Year," the "Penrose Process Year-Book," "The Photographic Annual," etc., will also be published.

This change of location, the third in our busy and eventful history, is made necessary because of the steady growth of the various interests of THE PHOTO-MINIATURE and its publishers. The new offices are conveniently situated on East 25th street, between Fourth and Lexington avenues, less than two blocks east from Madison Square Park and "right in the middle of things" generally. By this change we gain more than double the space hitherto occupied, from which increased room and facilities we hope to make our work still more useful to our readers everywhere.

As announced elsewhere, the next number of THE PHOTO-MINIATURE, to be published in about a fortnight from date, will be devoted to film photography. This will bring the subject right up to date and tell the reader all that there is to be told regarding the newest developments of the art of making photographs by means of the now universal flexible film. We anticipate a very large sale for this number, to the preparation of which we have devoted great care and pains. This will be No. 89 of THE PHOTO-MINIATURE, and it will pave the way, so to speak, for No. 90 (June), which

will be in the hands of the trade on May 25, and will place the magazine on correct publication time. The July number will be published on June 25; the August number on July 25, and so on during the remaining months of the year, THE PHOTO-MINIATURE thus reverting to its former habit of appearing with unfailing punctuality and regularity month by month.

"Camera Workers" is the title of the latest New York photographic society. It has premises and a studio at No. 122 East 25th street (between Fourth and Lexington avenues), New York. Such are the curious coincidences of life that this fine building also embraces the new home of THE PHOTO-MINIATURE. We wish the new society all success at the outset of it career. It is for workers and workers only we understand, and it is to be run on democratic lines. So far, no particulars of its constitution have been vouchsafed, but that omission will no doubt be remedied as time goes on. The last year or two have witnessed many striking changes in photographic society life all over the world. "The old order changeth, giving place to new," with great rapidity nowadays. Mr. Alfred Stieglitz, who was the central figure in a recent sensation, has been reinstated in the New York Camera Club, has subsequently resigned, and so everything has ended happily. So let there be general joy, brethren.

The Portrait Unar is a recent lens production of the Bausch & Lomb Optical Co., Rochester, N. Y. It is of anastigmatic construction and the full aperture of the series (1B) is *f* 4.5, which approximates to that of the old Petzval form, the ordinary portrait lens hitherto most commonly in use. Where this latter kind of lens fails in a sufficiency of covering power, the Unar is claimed to have uniform definition over the entire plate at the effective aperture. The lens is suitable for groups, full figures, three-quarter figures, and bust pictures. A slight separation of the systems gives the softness and roundness so much in vogue by some

workers. The Portrait Unar is less bulky in size and weight than the ordinary type and the old rack-and-pinion adjustment has been abolished. The lens has iris diaphragms and appears to be a great advance in portrait objective construction.

Mr. F. K. Hurman, well known on both sides of the Atlantic as the founder of the photographic dealing business of F. K. Hurman & Co., Newcastle-on-Tyne, England, and latterly as managing director of Hurman, Limited, Birmingham and Dublin, has, we learn, resigned that position. There does not appear any certainty as to Mr. Hurman's future movements, but we trust that the energies and abilities of so popular a figure in the photographic world will not be lost to us. It is not improbable that Mr. Hurman will visit the United States at an early date.

The G. Cramer Dry Plate Co., St. Louis, Mo., announce an Amateur Photographic prize contest for the best negatives made on Cramer Isochromatic plates. The negatives desired are those which will illustrate the advantages of those plates for views, clouds, portraits in colored costumes, interiors, flowers or any colored object. The following prizes are offered: First, $100 in gold; second, $75; third, $50; fourth, $25; ten other prizes each of $5 worth of Isochromatic plates. Only amateur photographers are eligible for the competition, which closes on January 1, 1909. Full particulars of the conditions are to be obtained of the G. Cramer Dry Plate Co., St. Louis, Mo.

Mr. William Crooke, of Edinburgh, Scotland, one of the world's outstanding professional portraitists, has recently said some hard and uncomplimentary things about the gum-bichromate printing process, which acquire weight and importance by reason of the author's eminence in his profession. They had, he said, a multiplication of processes. Some of them were purely pho-

tographic, others were in a sense mechanical, and others were in a sense artistic. They had the gum-bichromate process, by which a man was assisted to obliterate from his work all the photography possible. If the minds of those who used it were always properly trained he had no objection to raise, but he had no sympathy whatever with its users when artistic errors were made. There was every apology for a man who did a simple, pure, and natural photograph, who, the conditions being against him, did not get exactly what he would like. That man was trying to do a good thing. But the gum-bichromatist who failed was trying to spoil a good thing. He had no sympathy with those who used the "bigum" process, and did not know what they were doing. Work on the negative, again, was much employed. There was nothing to be said against this provided they knew what they were doing, but it was a dangerous practice if this were not so.

The general catalogue of photographic dry plates, filters and safe-light screens, of Wratten & Wainwright, Limited, Croydon, England, has reached us. A special feature of the catalogue is the information it gives on the subject of screens for orthochromatic photography. Dr. Kenneth Mees, who is the technical director of the house, has done much work in standardizing these screens, so that the photographer knows exactly which kind to use in given circumstances, the exposure required, and so forth. Plate-users will find much else to interest and instruct them in the catalogue. It deserves to be mentioned that Wratten & Wainwright have been continuously making dry plates since the year 1877.

A Canadian reader of THE PHOTO-MINIATURE, Mr. H. Renbold, of Aylmer, Ontario, sends us two clever sets of genre photographs, in which his little daughter, a pretty and plastic child, forms the chief actor. In one set she is represented as a judge trying a breach of promise case, and there is much humor and *naivéte* in the amusing pictures. A second set depicts

the child as an orchestral conductor, and the various phrases of the baton artist's tribulation and triumphs. We have seldom seen cleverer photographs than these, in which humor is so subtly shown by the camera.

We have to acknowledge receipt of interesting catalogue, and other matter, from the firms of Zeiss, Jena, Germany; Steinheil, Munich, Bavaria; Beck, Cornhill, London; Sanders & Crowhurst, London; and other foreign houses. These we will deal with in early numbers of THE PHOTO-MINIATURE.

The little galleries of the Photo-Secession, at 291 Fifth avenue, New York, will not, as at one time seemed likely, be removed from that address. The most recent exhibition given was of the works of Eduard J. Steichen, who has lately returned to Paris. Mr. Steichen shows a versatile command over modern printing processes and there seems no limit to his power of controlling results. We wish he and other masters of the work would make up their minds to stick to one definite medium of photographic expression. Their ultimate reputations we are convinced would thereby greatly benefit, and less confusion in the minds of their followers would be created. Some very fine autochromes by Steichen were included in the exhibition. His work and the methods of it figure largely in the current number of "Camera Work," which is chiefly notable for a description of his way of making autochromes. That number will no doubt have a conspicuous success.

In view of the 1908 Kodak advertising contest, of which we have already given particulars, special interest attaches to the Portfolio of the 1907 Kodak advertising competition, which has just been published by the Eastman Kodak Company, Rochester, N. Y. There are thirteen reproductions from competing negatives printed in this dainty book. The frontispiece is an adaptation in color from one of the pictures from the first prize group.

It received the award of $1,000. It is a pleasing study of a winsome girl affectionately fondling a Kodak. We envy that Kodak; indeed we do. In all the remaining pictures the Kodak has been cleverly introduced into the pictorial scheme of each composition, and the results all through are ingenious and striking. The Portfolio makes an attractive collection of skilfully designed and executed photographs which should be in the hands of every competitor in the 1908 contest.

The proverbial long-felt want has again been filled in the shape of a handy little thermometer for use in tank development, giving at a glance the temperature of the developing solution at any desired moment. The new introduction comes from the firm of George Murphy, Inc., New York, and is peculiarly suited for use with the Eagle tanks, fitting snugly into the pouring chamber at the back of these tanks. It will doubtless be widely appreciated.

A new developing-tank for plates is being introduced by the Eastman Kodak Company, and several novelties in camera-construction are promised for the photographic season just opening,—of which we hope to give definite information in the forthcoming number on "Photography with Films."

According to the "British Journal of Photography" Dr. R. Luther, whose appointment to the Professorship of Photography in the newly founded faculty of photography, in the Imperial Technical High School at Dresden, was recently announced in these pages, was born in Moscow, in 1868, and after passing through the universities of Dorpat and Leipsig became assistant to Professor Beilstein in 1890–1894. From 1894–1896 he was assistant to Professor Ostwold in Leipsig, and in the latter year became assistant in the Physico-Chemical Institute of the Leipsig University, from which position he was promoted to that of sub-director in

1900. Since 1906 he has been Extraordinary Professor for Physical Chemistry at Leipsig. During his university career Dr. Luther has contributed many papers on photo-chemistry, notably those on reversible photographic processes, the latent image, the swelling of gelatine, the oxidation of sodium sulphite and of sodium thiosulphate in the air.

According to a note from the Ansco Company, Binghamton, N. Y., Ansco film is again in the market and has been still further improved in quality. We also learn that the demand for Ensign and Barnet films has severely taxed the respective agents for these films in this country. Similarly, a prominent city dealer tells us that his sales of Kodak film and film-packs during the last two months have far exceeded any previous records for February and March sales. All of which seems to indicate that the use of films is rapidly becoming universal.

We have received from J. Lancaster & Son, Limited, of Broad street, Birmingham, England, a copy of their 1908 catalogue of photographic apparatus, a freely illustrated publication of 74 pages, which lists and describes a great variety of modern hand cameras in the reflex form, the folding pocket, the box-form magazine and many others. The firm of Lancaster was established in the year 1835, and very properly boasts of having distributed many hundreds of thousands of cameras. Those interested in the productions of the house should procure a copy of this catalogue, which is mailed free on application.

Mr. F. A. Bridge, the honorary secretary of the Photographic Convention, of the United Kingdom, sends us the complete program of the 23rd annual meeting which, as we have already announced, is to be held, this year, at Brussels, under the presidency of Sir Cecil Hertslet, F.R.P.S., the British consul-general for

Belgium. The principal attractions of the week are the excursions to the old Belgian cities, which offer the photographer a wealth of opportunities for making pleasing pictures of old-world architectural remains. Any American readers of THE PHOTO-MINIATURE, who may be contemplating a trip to Europe this coming summer, could not better diversify it than by putting in a week at the British convention. The address of the secretary is F. A. Bridge, East Lodge, Dalston Lane, London, N. E., England, and he will gladly send full program and particulars, on request.

Loeber's Bulletin, published by Chas. H. Loeber, 15 East 17th street, New York, made its first appearance in March, of this year. The reason of the publication is that it enables C. H. Loeber to get in closer touch with his patrons. "A regularly issued, printed page is infinitely more satisfactory than the spasmodic circular," is the official pronouncement. New apparatus, new ideas, new formulæ are to figure in the bulletin, which promises to be a useful sheet.

Self-toning papers have established a popularity amongst amateur photographers which does not seem likely to abate. The convenience of this system of printing is so great that few photographers, at some time or other, fail to make use of it. For the rapid proofing of a negative, the striking of a print which only needs fixing in hypo and washing in water, offers an ideal plan of working. Such a paper as this is "Seltona," marketed by J. L. Lewis, 379 Sixth avenue, New York, which we ourselves have, at times, used with great success. The process offers a good range of color. By simple fixation and washing it gives brown or sepia tones, whilst brown, purple and even blue can be obtained by washing the print, before fixing, in a solution of common salt and water. The paper is issued in a variety of surfaces, matt, smooth and glossy. "Seltona" is essentially a busy man's printing process, but it is so good and artistic in its results, it gives pictures of such beautiful photo-

graphic quality and richness, that it supplies a perfect surface for securing the most admirable pictorial and technical effects. Readers of THE PHOTO-MINIATURE should most decidedly try "Seltona."

Difficult though it is to import the element of novelty into the character of a modern photographic annual, yet this is what has been done by our confrére, Mr. H. Snowden Ward, F. R. P. S. Taking the third edition of the well-known compilation "The Figures, Facts and Formulæ of Photography" as a basis, he has converted it into an annual publication called "The Photographic Annual 1908," which is published forthwith. This book is obtainable of Tennant & Ward, 122 East 25th Street, New York, price 50 cents. The size of the book has been doubled and the matter rearranged. Entirely new sections devoted to artificial light, color photography, and press photography have been added, and practically every branch of the subject is dealt with in the main body of the volume. "The Photographic Annual 1908" will have a wide sale and it should be ordered at once.

The Multi-Speed Shutter Company, of 324 East 65th street, New York, advise us that the Multi-Speed Shutter is now made in small sizes for the 3A Kodak, 4 x 5 and Stereo cameras. The high speeds of the shutter range from $\frac{1}{200}$ to $\frac{1}{2000}$ of a second. The season of the year being at hand when outdoor photography again comes within the range of practical work, the hand-camera man should make a point of securing a copy of the Multi-Speed booklet in which the characteristics of this shutter are discussed and set forth.

The Art of Retouching Systematized is the newest addition to the not very voluminous literature of this important subject. It is by Ida Lynch Hower, instructor M. I. L. Retouching School, and it is published by A. C. McClurg & Co., Chicago. Consisting of 48 pages, it

is illustrated by examples of retouched portraits, etc., and gives practical instructions in retouching "from the standpoint of over a quarter of a century of professional training on the part of the author." The book, on perusal, shows the writer to have a good grip of the subject, and it will probably have considerable vogue amongst those to whom it is addressed, namely professional workers. Our publishers, Tennant & Ward, 122 East 25th St., New York, supply the volume at $1.

The monograph of the present issue of THE PHOTO-MINIATURE is, as the reader will have discovered ere this, devoted to the subject of Defective Negatives, with Practical Remedies. One of the many of those defects is remediable with Intensine, a new intensifying powder which Burke & James, of Chicago, have introduced to notice. The reader should make a note of Intensine when he comes to put into practical use the teachings we have set out for his edification in this number of THE PHOTO-MINIATURE.

The success of this year's "American Annual of Photography" was so great that the cloth-bound, or library edition, has been quite exhausted. However, a fresh supply of the book has been put into covers and copies are obtainable of the sales agent, George Murphy, Inc., 57 East 9th street, New York.

We always look for good Literature of the Catalogue from the Century Camera Division of the Eastman Kodak Company, and are not disappointed with the latest specimen of book production illustrative of the Century products which has come our way. From cover to cover this book is full of interesting matter relating to the Century Series of Cameras. We are much impressed by the excellence of the accompanying half-tone illustrations made from negatives taken in the Graflex, Century and other cameras. One of them, a view of Trinidad, Colorado, is a reproduction of a

print from a nine-foot negative, taken in a Cirkut camera. It is, as may be supposed, a panoramic view and a fine piece of work. Decidedly this Century booklet, with its dainty cover picture in colors, should find its way into the possession of every camera user—especially now, when springtime at last has come.

"The finest street in the world"—Fifth Avenue, to wit,—has recently housed another prominent photographic firm, Messrs. Voigtlaender & Sohn, the well-known opticians, having their offices and showrooms at No. 225 of "that gilded thoroughfare," to quote a favorite phrase of the late Lord Beaconsfield. Voigtlaender's, we observe, are making a special feature of the Dynar lens, which is furnished with cells for fitting to the 4A; $3\frac{1}{4} \times 4\frac{1}{4}$; $3\frac{1}{4} \times 5\frac{1}{2}$, and 4×5 kodak series of hand cameras. A catalogue is sent free on application to Voigtlaender & Sohn A. G., Optical Works, 225 Fifth Avenue, New York.

Probus is not a remedy for defective negatives, nor even an antidote, but it is, in some sense, a preventive, and should form part of every photographer's equipment. It is a waterproofing preparation and can be used for coating the dark-room sink, shelf, wall, or floor. Then a few coats of it can be applied to developing, fixing and washing trays made out of wooden or card boxes. So it is a promoter of cleanliness and a preservative of apparatus, and, therefore, we assign Probus a distinct place amongst the impedimenta of those anxious to avoid making defective negatives.

The Agfa Intensifier and Agfa Reducer, sold by the Berlin Aniline Works, 213–215 Water St., N. Y., are two agents in the correction of negatives which may be commended to the attention of our readers. They should be at hand when the photographer comes to ask himself how best he may compensate for the errors which his lack of experience has caused him to produce in his

negatives. From the same house we have also received a specimen of a cleverly conceived exposure-table and guide, called the Agfa Blitzlicht-Tabelle. This is on cardboard and by means of sliding scales all the data of subject, light, lens aperture, and plate-speed may be so easily correlated that the necessary exposure required can be calculated out.

Many of our readers have no doubt enjoyed reading a popular book of the season, entited "Camp Fires in the Canadian Rockies," by W. T. Hornaday, illustrated from negatives by John M. Phillips. It is worthy of note that the enlargements from which these excellent illustrations were made, were produced by E. F. Keller, 108 Fulton St., New York, whose services as an expert in printing, enlarging, and lantern slide-making we are happy to bring to the notice of those of our readers who may require them.

Pictorial photography evidently does not lead on to fortune. We are sorry to read in our contemporary, *Photography*, that the late A. Horsley Hinton, whose death we had to chronicle in the last issue of THE PHOTO-MINIATURE, left his widow in such straitened circumstances that a public appeal for assistance on her behalf has been issued. The honorary treasurer of the fund is R. W. Craigie, and subscriptions should be sent to him at 52 Long Acre, London, England. We trust that a liberal response will be made to the appeal. Hinton was certainly a hard worker and undoubtedly hastened his death by what we always looked upon as a quite needless strenuousness in the cause of British Photographic Society and Exhibition work.

Our British contemporaries have recently "broken out" in the direction of plethoric spring numbers, and the quantity of advertisement matter handed out to them has been prodigious. The palm for success in developing this idea must be awarded to *The British Journal of*

Photography, which devoted its issue for March 27 to a "Colonial Number," the contents being so devised as to interest photographers in the outlying parts of the British Empire. The editor is to be congratulated on the obvious success of an undertaking which must have cost him much time and effort. This feature of the "oldest established" is, we gather, to be made an annual fixture, and we have no doubt it will always be appreciated.

The "Marvelous Donisthorpe Process," advertised in England, excites our curiosity. This wonderful discovery, as it is styled, means roll-films at the price of plates, cut-films and printing papers at low prices, the abolition of printing frames, toning, fixing washing—"just contact with the prepared negative"—and many other extraordinary things. Printing-papers, we read, are not sensitized, so they can be worked in full sunlight, artificial light, or no light at all. Color work, moreover, is printed on paper by the same principle—three contacts with the negative, instead of one. "Any amateur can work it," says this bewildering advertisement. We want to know more of this marvelous process, so, perhaps, will our readers. Let them address, then, the Donisthorpe Patents Company, 6 Southampton street, Strand, London, W. C., England.

Though the season for flashlight work is on the wane, there may be many professional readers of THE PHOTO-MINIATURE who will welcome a brief description of the latest piece of apparatus for the purpose. This is put on the market by Charles Zimmermann & Co., the London agents for the Berlin Anilin Company. It is called the "Dega" Professional Electro-flash, is self-contained and provided with means for elevating the flash-pan to a considerable height above the ground. A box, containing the batteries and necessary fittings, forms a base to support a telescopic upright, which extends from three to eight feet in height. The flash-pan, of extending design, fits on the top of the upright. Electric

connection is made between the flash-pan and batteries in the box by means of a silk and rubber-covered flexible wire, and the control button can be carried to a distance of twelve feet from the apparatus. The apparatus, without the upright, measures 15 x 9 x 3 inches. It costs, complete, three guineas.

The "Thames" color plate has recently made its appearance on the photographic market, and was demonstrated for the first time before one of the London photographic societies earlier this month. It appears to be a plate which can be exposed in any camera and give a colored positive by ordinary treatment. We have not yet seen any account of the demonstration and shall be curious to learn what reception the process will secure at the hands of the practical men before whom it is brought. A box of four-quarter plates costs sixty cents and the lens color-screen five shillings. The market just now is rich in photographic novelties. We wonder how many of them will survive a year or two's practical trial.

A Road House in the New Forest, Hampshire
George T. Harris, F.R.P.S.

A New Forest Lane, Hampshire

A Surrey (Eng.) Cottage
Thomas Bedding, F.R.P.S.

A Kentish (Eng.) Trout Stream
Thomas Bedding, F.R.P.S.

The Photo-Miniature

A Magazine of Photographic Information

EDITED BY JOHN A. TENNANT AND THOMAS BEDDING, F. R. P. S.

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Photography With Films

The Siege of Paris, during the Franco-Prussian war of 1870-71, brought out, as it were, by anticipation, one of the most striking evidences of the conveniences of film photography—the modernized film photography of 1908 to which we are devoting this number of THE PHOTO-MINIATURE. Despairing of reaching the outer world by the ordinary means of communication, for the victorious Germans had stopped all trains and cut the telegraphic wires, the beleaguered citizens reduced the letters and other documents they wished to transmit, by microphotography, attached the tiny films to carrier pigeons, and when the birds reached their destinations the films were enlarged and the messages they contained easily transcribed or read off. The films of those days were sheets of sensitized collodion; and the microphotographic system for making the reduced images was one of obvious minuteness and delicacy, requiring greater nicety and knowledge in the handling than the pampered amateur of today—the heir of all the photographic ages—would care to exert in these times. But there was the germ idea of film photography, which is still in process of fructification all over the world. "Bother those ancients," once exclaimed a *soi-disant* inventor, "They've stolen all my ideas!" Photographic ancients were full of good ideas: they only stopped short at working them out.

The history of film photography need not concern us here. It has already been written in THE PHOTO-MINIA-

TURE No. 37 (April 1902), and stands for all to read and profit by. We are interested at this moment in nothing outside the everyday application of the sensitive flexible film to the making of photographic pictures. Far fetched though the parallel between the microphotograph of 1871 and the film photograph of 1908 may at first seem to the unreflective, it really is not so: for both the one and the other are simply systems of making negatives on flexible substances of comparatively large originals, and turning them afterward either into contact prints on paper or glass, or into enlargements. Microphotography, it should be explained for the information of those who may not happen to know, is simply the use of a lens of very short focus for making the negative, it thus being possible to get a finely defined image of an original in a very small field. Practically this is what is done by every lens on every subject, except that the pictures do not fall within the category of the microscopic or the very small. It is a question of degree, of course.

Film Photography Described

The early convenience of film photography, *per se*, having thus shown itself capable of compelling its own appreciation, we pass at a step to a consideration of the question, What is film photography today? In reply: It is the all but universal system of negative-making in current vogue by amateur photographers all over the world. The reservation is gradually disappearing, and except for special work necessitating the use of glass plates, nothing but films, in course of time, will one day be used by non-professional photographers in the making of pictures for pleasure. It is an age of simplicity. The employment of films instead of glass plates minimizes the weight of the sensitive agent; makes the camera lighter, more portable and compact; and diminishes e burden of the photographer all through his work from start to finish. Time was when the photographer, in search of the picturesque, went forth with a heavy burden of cumbersome apparatus on his back. So swift, so sudden, is our journey along the path of progress that that time seems only yesterday. Today we carry the camera and the supply of films in the pocket

and do not notice the weight. Moreover, Madame Tout le Monde, not to be outdone by Monsieur, adds a camera to her traveling impedimenta, with the easy nonchalance that she would address to the packing of a veil or an extra pair of gloves. It adds to her happiness and comfort and entails no inconvenience.

The Film When the photographer obtains his camera and roll of films, the world, photographically speaking, is "all before him where to choose." This wonderful spool of film is the *dernier cri*, or last word in chemical manufacture and ingenuity, by which the making of the photograph in its initial stages has been brought down to the simplest and most economical plan of working. Held within the band of black paper that is wound on the wooden reel is a strip of flexible substance coated with light-sensitive bromide of silver in gelatine upon which the exposure is made. This substance is celluloid: hard, transparent and rollable, and it is prepared by treating pure white paper with a mixture of sulphuric and nitric acids, a process which converts it into what is technically known as nitrocellulose. When this has been freed from the acids, the residual mass is acted upon by wood alcohol and camphor, which gives us the basic body, celluloid. Further processes of manufacture, not now necessary to describe, convert the celluloid either into the rollable ribbon form, like that contained in our spool, or into cut sheets for use, when coated with sensitive gelatino-bromide of silver, in plate-holders or special carriers, to which we shall refer at a later part of this monograph. The celluloid, in its finished state, is hard and durable, and is practically unaffected by alkalies, acids, and ordinary atmospheric conditions. It is soluble in, amongst other liquids, alcohol, which therefore cannot be safely used in the development or other manipulation of celluloid films. All this by way of slight introduction to the chemico-physical properties of celluloid. Regarded from the standpoint of convenience, it is a tribute to American genius in making practical photography so simple that even the little child is capable, of its own intelligence, in successfully making the first steps in photographic work by means of roll film in

a small camera. Even "children of a larger growth," as Carlyle calls us, when life has lost all its illusions, are not proof against the fascinations of film photography, and may with care, as we shall point out, get good results, which time and memory will one day hallow and sanctify for them.

Advantages

The use of transparent celluloid as a support for the sensitive film of bromide of silver entails advantages that seem all the greater when a comparison is made with glass, the other body used for supporting the film. It is light and it is unbreakable. It altogether dispenses with a dark-room in loading the camera, as the spool can be placed in the instrument in full daylight. The roll film is rewound on the spool as the exposures are made, the black light-tight outer paper acting as a protective; and the whole thing is then easily removed from the camera, retained until a convenient time for development, and the work of exposing repeated ad infinitum without going into the dark-room. These physical advantages briefly explain the enormous popularity which film photography enjoys today. At one time they were balanced or offset by drawbacks which experience and improvements in manufacture have neutralized. We allude to the keeping properties of the film before and after exposure. In theory, celluloid is not so chemically inert as glass or paper—another support that is to come in for mention hereafter—and so some kind of reaction between the support and the film, to the degradation of the image may have reasonably been feared; but those dangers are past. Carefully protected from extremes of climate and temperature, rollable celluloid films keep well both before and after exposure.

Non-Curling Films

There is a strong tendency with some rollable celluloid films to curl during or after development. In the case of "N. C." or non-curling film, this tendency is counteracted by coating the plain or uncoated side of the film with a solution of gelatine. This expedient completely obviates any curling tendencies in the processes of development and subsequent manipulations. Non-curling film is also obtainable coated with an isochromatic emulsion for the

correct color rendering of objects. The development of these films must be conducted in a "safe" dark-room light. In photographing with these orthochromatic films, the use of a yellow screen in front of the sensitive film or on the lens is necessary if a true monochromatic rendering is required: the action of the screen being to depress the activity of the blue and violet rays of the spectrum and allow the other rays to act in impressing the film. Non-curling films being coated on the back with gelatine should not be dried on blotting-paper, or any other surface, or the film will adhere. Usually they are suspended in a metal clip and hung up in the strip, or cut separately and pinned by the two upper corners to a shelf edge or cord line across a convenient window.

Light Filters

The position of the filter in film cameras should in most cases be either in front of, or immediately behind, the lens. The latter position takes advantage of an arrangement devised by Mr. E. Sanger Shepherd. A brass collar to fit the lens hood is attached to a grooved arrangement into which the (square) screen is slid, it being held in position by springs, which are placed in the grooves. A behind-lens shutter is necessary with such a shutter as this. An arrangement that we have used with success is due to the Ilford Company. On the lens board inside the camera a rectangular grooved metal frame is fitted; this holds the glass light filter, which can easily be removed when non-orthochromatic effects are sought. Circular filters can also be purchased to fit inside the lens hood. For the Film Pack, a glass screen may be placed in the adapter, immediately in front of the removable tab.

Commercial Films

The varieties of roll films at present available in the American market include the Eastman (Kodak); Ansco and Vidil; Austin Edwards (Ensign); Elliott (Barnet); and Lumière films. All these, with the addition of the Wellington, Marion and Roto Films, are also available for British workers. The American or English reader traveling on the continent will usually find Kodak and Lumière roll-films stocked by dealers in the larger cities.

Of flat cut films, for use in plate holders by means of

special carriers, the Seed film is the only one obtainable in this country. In Britain several varieties are available, viz., those made by Elliott & Son, B. J. Edwards & Co., Ilford Company, Mawson, Marion. Separate mention is demanded by the Premo Film Pack, an American invention providing twelve cut films for use in any ordinary camera, which is obtainable from most dealers in America and Europe.

In the category of films must also be included Roto negative paper which is supplied in cut sizes and is used by many amateurs in place of the celluloid cut film. Ordinary bromide paper in cut sheets belongs to the same class. The root idea, of course, in all these roll or flat films and papers is the use of a thin, flexible, non-breakable support for the sensitive emulsion, with the intention of securing portability and economy of weight and space.

Vidil Films

This is a system of enabling the picture to be focused between the exposures. The spool contains twelve films separately attached to the backing-paper, each film alternating with a focusing screen of semi-transparent parchment paper, so that the photographer is able, before each exposure, to focus the picture with the assistance of this paper, which is marked with cross lines. Practically, this sheet of parchment paper takes the place of a ground-glass focusing-screen. To take advantage of the Vidil system, a special hood must be attached to the back of the camera; such a hood is supplied by several apparatus-makers. After focusing, the hood is folded up, and the film wound in the usual manner, to bring the sensitive surface facing the lens. The Vidil films may be developed separately, in the same manner as other cut films, each film being perforated and attached singly to the main support.

Sizes of Roll Films

The sizes of roll film in general use are as follows, and, of course, they govern the size of the camera employed: $1\frac{1}{2} \times 2$ inch; $2\frac{1}{4} \times 2\frac{1}{4}$; $1\frac{5}{8} \times 2\frac{1}{2}$; $2\frac{1}{4} \times 3\frac{1}{4}$; $3\frac{1}{2} \times 3\frac{1}{2}$; $2\frac{1}{4} \times 4\frac{1}{4}$; $3\frac{1}{4} \times 4\frac{1}{4}$; $3\frac{1}{4} \times 5\frac{1}{2}$; 4×5; $4\frac{3}{4} \times 6\frac{1}{2}$; $3\frac{1}{4} \times 6\frac{3}{4}$; $2\frac{1}{4} \times 7$; 5×7; $6\frac{1}{2} \times 8\frac{1}{2}$. Larger sizes are seldom used except, of course, in panoramic work.

These being standard sizes, the cameras are made to them and so the films to fit are easily obtainable of dealers here and elsewhere. The choice of a size is a matter for the individual photographer to decide upon. Bearing in mind the fact that the negatives are very often made with a view to subsequent enlargement, the natural tendency will be toward smallness of dimension, inasmuch as quite as good photographs can be made on the $2\frac{1}{4}$-inch film as on one several times its size. As we have already said on another subject, the matter is purely one of degree. For ourselves, we prefer a $3\frac{1}{4} \times 4\frac{1}{4}$ or $3\frac{1}{4} \times 5\frac{1}{2}$ film camera. Either gives us all we want in size for contact printing, and is pictorially large enough for the presentation print or the commemorative album. The sizes of cut films are those of glass plates in general use.

Cameras

Roll-film cameras are of two kinds, the box form and the folding form. The new 3A Graflex offers a clever adaptation of the reflex form of camera for the use of roll films. In all forms the vital principles of construction remain the same throughout. Within the space of a few inches are contained the lens which forms the image, the shutter that controls the exposure, and the focal plane upon which the image of the object to be photographed is received. The entire system is boxed in to exclude all light except that which passes through the lens to form the picture, and it is in the doing of this that the camera-makers choose one of two plans of working, and give to the instrument its particular form of construction, adopting, on the one hand, the box kind, which was the original camera of the ancients, or the folding, collapsible-bellows form of the moderns. But, whichever kind or type of camera the photographer has selected, the method of using the roll of film remains the same. In the rear of the camera the spool of film is placed in position on the left-hand side or bottom film-chamber of the instrument. Usually the top metal disc of the spool has the word "Top" stamped upon it, and there are holes in the reel in which spring-controlled pins in the camera engage. The spool being placed securely in position, the end of the black paper covering is disen-

gaged and led over revolving rollers into a thin aperture on the receiving-reel at the right-hand side or top film-chamber of the camera. A few turns of the reel makes the black paper taut. Then the back of the camera, which has been removed in order to allow of the insertion of the spool of film in its proper place, is replaced; and the unwinding of the black paper is proceeded with until the appearance of the figure I through the red aperture on the back panel of the camera tells us that our psychological moment has arrived, and that in the focal plane or image-receiving surface-plane of our camera our first expanse of sensitive film lies taut and ready for the exposure.

Cutting the Film

Spools of film are mostly issued by the makers with a sufficient quantity for six or twelve exposures; others, though rarely, four and two. Before removing the exposed film from the camera, give a few extra turns to the roller after the last number of the film has appeared at the indicator, and wrap the black paper around the spool. Then, when the roller runs easily, open the camera back and lift out the exposed spool. The exposures may be developed in the strip, in series of 2, 4, 6, ; or separately, one by one. For the development of single exposures, the film must be cut through at the correct points in the dark-room. This point will be found marked in white on the black covering paper. In cutting, the black paper should be unrolled over the film, that is, with the films downward, which will prevent the curling of the film. The paper and film should be cut through with a pair of scissors. If necessary, two or three exposures can be kept on one strip. As a matter of fact, the great majority of roll films used are developed in the strip in the convenient kodak film tank, the simplest and most certain method of film development.

Mis-cutting Films

A mishap with daylight spools, not uncommon with beginners, will happen when cutting up the film into sections for developing. The roll is laid down on the table, and, when taken up, something seems to have gone wrong, "the maker has put the film the wrong side out, and hidden the numbers printed on the black paper." The

cutting, however, is done against the marks for the purpose, and, when development takes place, a number of views are found to be cut through the middle. This happens through the film having been allowed to wind itself once around the whole roll, and so reversed its relative position. When this happens for the first time, the puzzle is so complete as to be more like a conjuring trick. We have seen many views so unconsciously bisected.

Tank Development If the reader will turn to THE PHOTO-MINIATURE No. 84, he will find therein a description of development by time and temperature, that is, "by the careful adjustment of a definite formula used at a definite temperature for a definite period of time." This is undoubtedly the simplest and most certain method yet suggested for the development of films or plates in quantities, and is admirably adapted for the development of roll films in the strip. The principle of the method described in THE PHOTO-MINIATURE No. 84 is practically applied in the Eastman Kodak Tank Developer, widely known and everywhere obtainable. The kodak tanks come in three sizes, for film spools 3½ inches, 5 inches, and 7 inches in width, so that all sizes of film from the Brownie up to the No. 5 Cartridge Roll-holder are developable in the tank. The method of manipulation for the development of roll films in this apparatus, and the formulas suggested for use with it are so fully described and explained in the booklet accompanying the tank that it is unnecessary to repeat them at length here. Suffice it to say from our extended experience with the kodak tank system, that the closer and the more intelligently the reader follows the official instructions and formulas, the more satisfactory and successful will be his results from its use.

For those who do not possess a kodak tank and desire to develop their films in the strip, the convenient roll-film developing-trough with a loose roller, such as that made by Burke and James (Chicago), or the Merito made by Parkinson (Liverpool), will be found to serve the purpose. The latter is briefly described on page 197.

When development is completed, the strip of film should be placed in a tray of clean water, sufficiently

large and deep to wholly cover the film, and well rinsed before being placed in the hypo solution. In the case of films developed in the kodak tank, this washing should be done before the film is removed from the tank.

Developers

A good developer for vigorous negatives is the following: *A*. Sodium sulphite, 6 ounces; hot water, 32 ounces; when cold, add pyro, 1 ounce. *B*. Sodium carbonate, 3 ounces; potassium carbonate, 1 ounce; water, 32 ounces; mix 1 part each of *A* and *B* with 2 parts of water. With underexposed results, dilute this developer with an equal volume of water. For overexposure add 10 to 20 drops of a 10 per cent solution of potassium bromide to every ounce. *Pyro metol*, suitable for very rapid exposures: *A*. Pyro, 55 grains; metol, 45 grains; potassium metabisulphite, 120 grains; potassium bromide, 20 grains; water, 20 ounces. *B*. Sodium carbonate, 4 ounces; water, 20 ounces; mix *A* and *B* in equal parts. *Ortol*, a non-staining developer: *A*. Ortol, 40 grains; sodium sulphite, 160 grains; water, 10 ounces. *B*. Sodium carbonate, 20 grains, sodium sulphite, 160 grains; potassium bromide, 5 grains; water, 10 ounces; mix *A* and *B* in equal parts. *Ortol-hydroquinone:* A well-known worker recommends the following: *Solution A*. Ortol, 70 grains; hydroquinone, 20 grains; potassium metabisulphite, 40 grains; water, 10 ounces. Dissolve the metabisulphite of potassium in 7 or 8 ounces of hot water, then add the ortol and hydroquinone and make up with the full quantity of water. *Solution B*. Sodium sulphite, 1 ounce; sodium carbonate, 1 ounce; potassium bromide, 15 grains; water to make 20 ounces. Mix equal portions of Nos. 1 and 2, and add this to half its bulk of water.

Another Method

In the development of strips of roll films, it will be well for the worker to scheme out a fixed system to which he will keep throughout his practice. For instance, a suggested plan is as follows: Suppose quarter-plate films are being handled, use a deep half-plate dish holding about ten ounces of solution. At the left of the table or bench, have a large dish filled with clean water, and another dish similarly filled on the right of the developing

dish. The exposed film is placed in the clean water in the left-hand dish and pushed below the surface of the solution so as to thoroughly wet it. After immersion of the film in the water for about a minute, take hold of both ends, one between the forefinger and thumb of each hand and form a loop of the film. Next place the center of the loop in the developing solution with the film side upward. Raise one hand, draw the film through the developer and keep it underneath until the end in the other hand touches the liquid. Raise the other hand, pulling the film through the developer until the lower hand reaches the surface. Repeat this motion until the whole of the picture is developed. Well wash the developed film in plain water, and then, if there are several negatives on the strip, they may, if thought necessary, be separately cut and fixed in a flat dish containing hypo. Another plan is to fix them by suspension in a jar of hypo. Provide a wide-mouthed jar about eighteen inches deep with a wooden board to go over the opening. On the board are placed four clips which will hold the ends of film and keep it suspended in the hypo. The use of the well-known Jay Nay clips will simplify this method of manipulation.

And Another

Another plan of development, recommended by F. W. Pilditch, has the merit of simplicty when special apparatus is not at hand. The developer is poured into a dish of the proper size and, when all is ready in the dark-room, a portion of six exposures is cut off, the waste end being grasped by a wooden clip. Dust the film by extending it on the table, fastening it down at one end with a pin, and passing a plug of absorbent cotton over its surface. Then, the pin being withdrawn, the film will roll itself up again. Now, carefully unroll the film in the developer, by immersing the rolled-up length—the clip being held in one hand—in the solution and while steadily raising the strip of film, assist its rapid unrolling by a slight touch of the fingers of the other hand. When once unrolled completely, the film is slowly lowered and will spontaneously roll up again into spool form; the lifting and lowering of the clip until development is complete, being all that is necessary. After

development is completed, the film is raised and lowered several times through clean water, then fixed in a jar containing hypo, and finally washed in another jar containing clean water. It is, last of all, hung up to dry by the wooden clip which has not been removed from it during the operations. By this method, only one hand is used, there is no contact of the film with anything but the solution, and ideal cleanliness of working is assured. Moreover, finger-marks are avoided.

Dr. Eisen's Method

Dr. Gustave Eisen, a well-known American amateur, proceeds as follows: He saves up his exposures until he has a a dozen or more rolls of twelve. Then he buys three cheap buckets. In one he dissolves enough pyro powders—Eastman's or Lumière's—to make half a gallon or more of developer. The second bucket is filled with hypo solution; the third with alum water. He unrolls the film spool, wets the films in a wash-bowl and folds the film on itself so that one-half of the film's back rests upon the other half. He then sticks a safety-pin through the two ends and dips the film up and down in the developer for six or seven minutes. Those films which are over-exposed are reduced afterwards; those that are under-exposed, Dr. Eisen argues, would not have been specially benefited by having been developed one by one. Another worker cuts the films before development, places each in a large bowl of water and covers the bowl with a piece of cardboard; then, when all the roll has been cut up, he takes the film which has the least curl in it and places it face downward in a good supply of developer made up of rodinal, 1 part; water, 30 parts. As soon as the image begins to appear, he takes out another film from the bowl and puts it in the developer, and by the time the image appears on this second piece the first film will probably be ready to transfer to the fixing bath. The process is repeated till all the films are developed. A large, deep dish, plenty of developer and plenty of solution are necessary.

Washing and Drying

An expeditious way of washing the developed film is to pin the film, face upward to a wooden board, raise one end of it slightly and then allow the water from a tap to run

gently on it. To dry them, pin them up to the edge of a shelf by corners, or clip them on to a line by American clips. Obviously, all dust must be excluded from the drying-room, or particles will settle on the surface of the film and cause spots in the prints. It is advisable not to hang the films up to dry with globules of water adhering to them, as markings may be caused by some portions of the film taking longer to dry than others. The adherent water should be removed by drawing each film against the side of the porcelain dish, as it is taken from the washing water. In warm weather the gelatine surface of the film sometimes becomes soft and blisters. This may occur if the temperature of the developing and washing solutions exceeds 65° Fahr. To obviate this, soak the films, after fixation, in a solution of 1 ounce of alum in 20 ounces of water. Then well wash the films. In dry weather roll films have a tendency to curl and roll up. This can be obviated by soaking the films for five minutes in: Glycerine, 1 ounce; tap water, 40 ounces. Then dry in the usual way. A useful device for removing the excess of moisture from the films is the Primus squeegee made by Butcher of London. The squeegee is made in two halves hinged at one end, the handle having a groove and rebate which ensures the instrument being firmly gripped. Abrasion of the film is prevented as soft rubber is used. The film is drawn through the rubbers which squeegee off superfluous hypo solution, and water after washing.

Film Developing Dishes

Houghton's, Limited, London, supply the Economic roll-film developing dish, which consists of a porcelain tank with a roller at the bottom working in a groove. The film is placed under the roller, which revolves and works in and out of the developer until the whole spool is finished. The whole twelve negatives on the spool are just as easily developed at once in such a dish as one exposure by itself. Parkinson, Limited, of Liverpool, England, supplies a similar dish, which has a roller with a rod passing through the circular holes in the sides of the dish. The withdrawal of this roller makes the dish available for glass plates. The uses of these dishes have previously been referred to on page 193.

Film Drying Boards

A board on which to dry films may be made in the following simple manner: Procure a piece of clean pine board, wider than the negatives are long, say six inches wide for 4 x 5 film, and cut it to a convenient length,—from 3 to 4 feet is a handy one. Put in two screw-eyes in one edge to hang up by. Pin the negatives to this board by sticking a pin in each corner. It is best to leave the board unvarnished; with soft, unvarnished pine, the water on the backs of the negatives is absorbed by the wood and the drying is nicely done.

Helix Film Washers

A convenient washer for roll-film is the "Helix." The circular partitions of this washer provide for the insertion of a 12-exposure roll in two sections, and the inlet and outlet of the water are so arranged as to afford a free passage over the whole surface of the film. If the film is cut up for development, each negative is suspended in the water by a clip, and washing takes place in the same manner. The Helix washer is made in about half a dozen sizes by Kodak, London.

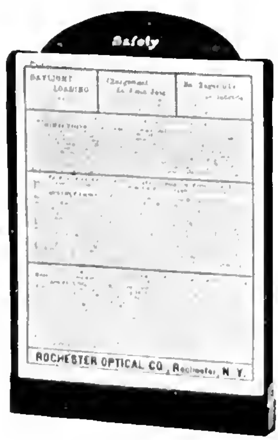
Frilling Troubles

Complaints of the frilling of films when developed in lengths are far more frequent than with plates. The best remedy is to keep a sharp out-look for five or ten minutes after washing, and, if the slightest signs of incipient frilling become manifest, to at once immerse the films in a 5 per cent solution of formalin. Usually all further frilling will at once be arrested. Should, however, frilling have taken place to an extent threatening the whole of the gelatine surface, the simplest plan is to "let it go"—actually assist the frilling—and, when the whole film is loosened from its celluloid base, to insert a glass plate underneath it and take it up, film and glass together, gently drain, and allow them to dry. There will then be a glass instead of a celluloid negative, and usually of slightly enlarged dimensions. It is better, when "collecting" the film on the plate, to let one edge slightly overlap the edge of the glass; there will then be no risk of the whole film slipping away when the glass and film are put up to dry. This method of preventing filling must be carefully employed.

Precautions With Formalin The formalin remedy must be applied at an early stage, for, if a considerable portion, say a third or a quarter, of the film be loosened and then the formalin applied, in all probability further frilling will be stopped; but that part already detached will be expanded, and will, upon drying, show wrinkles, and, further, will appear of different density from the normal portion of the negative. When this is found to be the case and the formalin is made use of, it will be impossible to detach the film altogether by any after-process for the purpose of attaching it to glass, as no method that we have met with, short of dissolving the celluloid away, will enable the gelatine to be separated; so firmly does the formalin seem to keep it attached to the celluloid foundation. Indeed, even were it possible to detach it, this portion would be non-enlarged and the difference in density would still be palpably manifest, and the wrinkling of the enlarged portion could not be got rid of even by immersion in spirit, which, as is well known, will reduce, under ordinary conditions, a swelled film to its original dimensions, as in the method of transferring a film by the aid of hydrofluoric acid.

Cut Films With the enormous growth in popularity of roll films, the use of cut films has necessarily decreased, always excepting the wonderful film pack which is, as it were, in a class all by itself. By cut films, as ordinarily referred to, we mean cut sheets of stiff celluloid coated with the usual sensitive emulsion, and intended for use in the plate-holders of any kind of plate camera. Such films, as already mentioned, are still made and sold here and in Europe. Their use is facilitated, both in the camera and in development, by film carriers which are obtainable from most dealers. There are also cameras fitted with special carriers, magazines and so forth, such as the Zambex made by Beck (London), the Film Envelope system of Houghton (London), and film packs which will be dealt with separately. Generally speaking, cut films are manipulated in the same manner employed with glass plates, the film carrier holding the film rigid in the plate-holder and in development.

The Film Pack Photography with cut films has passed through many stages of evolution. There have been cameras innumerable with magazine attachments carrying the films in sheaths, or dispensing with sheaths, according to the construction of the instruments; and the use of cut film in special carriers is a common device in ordinary cameras. It has remained for the Premo Film Pack, of the Rochester Optical Division, Eastman Kodak Company, to bring cut-film photography into line with the other simple and automatic certainties of modern photographic manipulation. The Premo Film Pack holds twelve cut films packed in a light-tight carton, on one side of which is an opening the exact size and shape of the film to be exposed. At the top of the film pack thirteen black paper tabs protrude. The first of them is marked with the words "safety cover," and the other tabs are marked in consecutive numbers from one to twelve. The safety cover tab is the continuation of a sheet of black paper which covers the opening above referred to, and protects No. 1 film from light. When the film pack is placed in position in the camera, the safety tab is drawn out as far as it will come, an operation which pulls the black paper in front of the first film round to the back of the pack. The first exposure is then made. Film No. 1 is attached to a similar piece of paper, the continuation of which is tab No. 1. After the exposure this tab is drawn out, pulling film No. 1 round to the back of the pack and uncovering film No. 2 ready for the exposure. All the tabs are withdrawn and the exposures made in this manner until the pack is exhausted. It may then be removed from the adapter in daylight and a fresh pack substituted. A valuable feature of the system is that at any time one or more of the films may be removed from the pack, for separate development, in the following manner: Take the camera into



The Premo Film Pack

the dark-room, remove the pack and cut the two red seals which are at each side of the pack and pull the bottom flap down, remove the exposed films, reclose the flap and replace the film pack in the camera. This operation can, obviously, be repeated at will.

The Adapter The adapter, in which the film pack is contained, is a valuable part of this system. It resembles in size and shape an ordinary plate-holder. There is no middle septum and the back is hinged so that the pack may be inserted in its place, the back closed and the adapter slid in the back of the camera just as an ordinary plate-holder is. There is a draw shutter in front of the adapter, which must be removed before an exposure is made. If the camera has a ground-glass screen, each image, before exposure, can be sharply focused, and then the adapter, with the film pack inside, placed in position, the shutter withdrawn, the tab removed and the exposure made in the usual way. Adapters of this description are fitted by many makers to ordinary cameras, so that the system is of universal application. The essential value of the principle, however, lies in the Film Pack itself, which is an ideal method of photography with cut films—simple, certain and efficient in practical work.

The Film Pack in the Adapter

Developing Film Packs After tank development of rollable films, comes tank development for cut films; and we have the principle pressed into service for exposures made in the Film Pack, thus still further simplifying the manipulation of cut films and adding to the convenience of the worker. The Premo Developing Tank, the adjunct to the Film Pack,

Removing Films from Pack for Development

consists of a metal receiver or frame for holding the films, and a covered circular metal tank for the developer. The receiver is divided into twelve compartments each holding one film. The receiver is circular in shape each compartment being a segment of a circle. As each film is taken from the pack it is held between the thumb and fingers, slightly bent from top to bottom and slipped into its respective compartment. When the compartments are filled, the receiver is placed in the tank, which is already filled with developer, the top replaced

Inserting Films in Receiver

and the films allowed to develop, preferably for a definite time at a definite temperature—time development, in short. After the films have been placed in the tank, no further attention is necessary beyond turning the tank, end for end, when half the time of development has elapsed. After development, open the tank, take out the receiver, remove the films, place them in a tray of water to wash for a few minutes and then transfer them to the fixing bath. Wash out the tank and receiver for future use and set them aside to dry. The removal of the films from the pack and the placing of them in the receiver should, of course, be done in the dark-room; and development be allowed to proceed in the daylight.

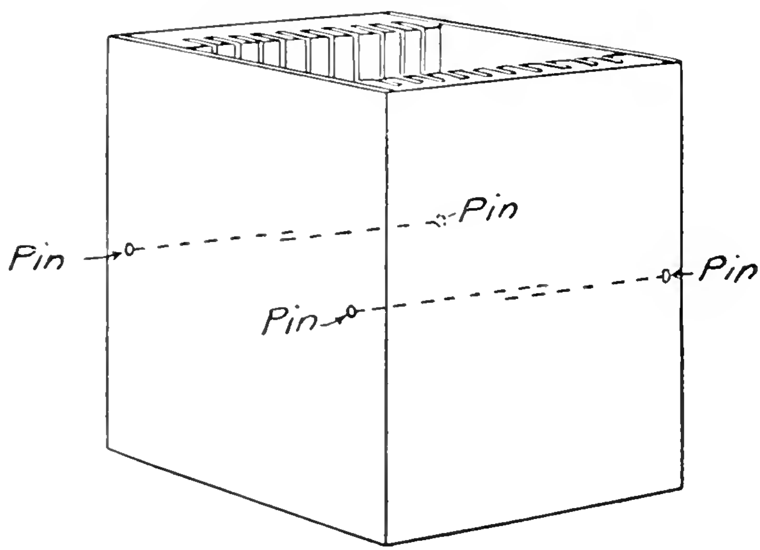
Those who prefer to develop their film pack exposures separately, however, will find no great difficulty in so doing. I have developed hundreds by the follow-

ing simple method without inconvenience or failure. Set out in the dark-room a deep tray, preferably 10 x 12 inches, holding 12 or 16 ounces of developing solution. At the right, place a pail or other vessel containing a generous supply of clean water and, within easy reach, put the fixing bath, preferably an 11 x 14 hard rubber tray holding half a gallon of acid fixing solution. The developing tray should be placed at a convenient distance from the safe-light window or lantern. Now sit down comfortably in front of the developing tray, break the seal of the film pack and strip away all but the pack of films and their black-paper separators, putting them in the left-hand coat-pocket or bib-pocket of your developing apron. Take four films in the left hand, handling them carefully, remove the paper back strip from each and, with the right hand, immerse them, one by one, in the developing solution. As each film is developed, remove it, rinse it in the pail of clear water and gently slide it, face up, into the fixing bath, which the fingers should *never* touch. Replace the developed film with an undeveloped one drawn from the pocket and so proceed until the twelve films are developed, rinsed and placed in the fixing solution. The whole operation can be put through in twenty minutes with ease and comfort and each exposure receives individual attention —a great satisfaction for those who prefer that way. When fixed, the films are placed in the developing tray under the faucet and well washed in running water for half an hour, after which they may be pinned to a line to dry in the usual way. For the developer I know of nothing more satisfactory than rodinal, 1 part; water 30 parts. It is cleanly, does not stain or fog, is economial and gives negatives of good printing density.

Placing Receiver in Developing Tank

Rettig's Method

George Rettig, in *The American Annual of Photography*, 1908, described a rack for holding the cut films during development, fixing and washing. Two strips of wood have grooves about one-eighth of an inch deep sawed in them. After being made waterproof, they are fastened together, the top and bottom of the rack being left open. The films are slid into the grooves and held in place by pins pushed through holes drilled across the grooves and as near the face of the strips as possible. These pins



also keep the films from touching each other during development. After being thoroughly wetted, to prevent air-bubbles, they are developed and fixed in the usual manner. A piece of stiff wire sharpened to a chisel point makes a good awl to drill the pinholes with.

Handling Film Negatives

Those accustomed to the handling of glass negatives must not imagine that celluloid will bear the same treatment as glass, nor that thin shavings of that material (which is, indeed, an exact description of spool films) are equivalent to glass. They are practically as transparent as glass, but there the likeness ends. They will not break, but, *per contra*, the film has not the same tight hold as

on glass, and the contractile nature of the gelatine twists and curls the celluloid under very slight provocation. Therefore, all film negatives should be kept in as cool a place as possible, and never allowed to lie loosely about, as, if such care be not taken, they may become unmanageable celluloidal curls and contortions; while, if they are allowed to remain in the sun for any length of time, the film may actually become detached.

Economy in Working

E. Mason in *Photography* gave some time ago the following plan of saving about thirty-three per cent of the cost of the films: I preserve the empty spools and long ribbon of black paper, being careful not to tear the latter when removing the film for development. I buy the hollow cores (not "daylight" loading), containing twenty-four exposures. Taking the 6½-inch core (twenty-four exposures 6½ x 8½ inches), it allows forty-three exposures 6½ x 4¾ inches. This works out at 2s. 6d. per dozen; practically as cheap as glass plates. I cut the film into six lengths of six and one of seven exposures. I attach them carefully to the lengths of black paper saved from the "daylight" spools, rewind them, and mark on the outside of each spool the number of exposures contained thereon. The other sizes are treated in the same way, the quarter-plate costing 1s. 2d., and the 5 x 4 inch, 1s. 8d. per dozen exposures. Of course, the rewinding must be very carefully done, but there is not much trouble if the lengths are confined to *six* exposures on each roll.

Cut-film Envelopes

Houghton's, Limited, of London, have placed on the market a system whereby the use of plate-holders is dispensed with in exposing cut-films. An adapter, resembling a combined focusing-screen and plate-holder, is fitted to the camera, from which it need not be removed when once placed in position. In the adapter, envelopes containing cut-films are employed. The envelopes are made of a strong, black, smooth paper and each one consists of three pieces. When taking a photograph, one of the loaded envelopes is placed in the adapter from the back. The film is uncovered by pulling the draw-out slide, and, after the exposure has been made,

the act of pushing the shutter of the adapter home encloses the film securely in its light-tight envelope. The back of the adapter is then opened and a new envelope inserted ready for the next exposure. The envelopes can be purchased ready loaded with the cut-films.

Films in the Tropics

In tropical countries: in Mexico, the Philippines, Hawaii, Porto Rico, Cuba, etc., special precautions are necessary in packing and handling celluloid films. They should, preferably, be packed in soldered tins. Damp, excessive light and lack of light-tightness in buildings should especially be guarded against. Each spool of roll-film should be well wrapped in wax paper. The supply of films should be kept well in the center of the traveling package—to protect them as much as possible from the influence of surface sunshine. The camera should be discharged each night, and do not carry partly exposed rolls over night, as the white exposure figures become imprinted on the surface of the film soon after exposure in the tropics. Avoid candle or bright-light lamps. Every night take each exposed roll of film and unroll it away from the paper backing. Re-roll it upon itself on the spool and then roll over it the black paper cover strip. This will prevent the painted number printing on the surface of the film. Re-wrap the exposed films in waxed paper and seal up the cardboard cartridge at both ends with passepartout binding strip.

Printing and Enlarging

In making enlargements from film negatives the following plan of supporting the film in the enlarging lantern answers well: Provide two pieces of thin glass, hinge them with a strip of stout paper or leather and bind them tightly together with India rubber bands. Let the film be sandwiched between the two sheets of glass and the whole thing placed in the kit of the lantern. The glasses should be of patent plate and free from scratches and bubbles; they should be slightly larger than the film which they enclose. If preferred, the film may be cemented to glass for the purpose. A suitable cement is Canada balsam, thinned down with benzol. A thin film of the cement is applied to the glass plate and to the celluloid side of the film, the two surfaces then being

pressed into contact and kept under pressure for a considerable time. The film negative is printed in the usual way in an ordinary printing frame, a piece of clean plain glass being inserted in front of the film to hold it in the frame. The actual details of printing from film negatives do not differ from the same operation when glass negatives are used. It is, however, useful to know that the film can be printed from either side with practically no difference in the results, except that the image is reversed as regards right and left when the celluloid side is placed next the printing paper.

Roll Film Printing-Frames

If the film-worker possesses a little skill in the use of tools, he can make a simple roll-film printing-frame by following these directions: An ordinary cheap printing-frame of the pattern that has open ends is taken, and the four square blocks that strengthen it are cut away. A strip of wood about one and a-half inches wide, and three-sixteenths of an inch thick is screwed on each side of the printing-frame, projecting about one and a-half inches at each end. Two empty roll-film spools are then taken and placed between the projecting arms, one at each end of the frame, and are fixed in position by screws through the arms, running into the ends of the spools. If the screws are driven in tightly, the arms are bent inward and form springs, and so prevent the spools from revolving too freely. Each film will require a few inches of the black covering paper glued to the ends. When the ends of the film are fitted to the spools, it is a simple matter to wind any portion of the film over the clear glass in the printing-frame, where it will lie quite taut and flat. Mellen's Panoramic Printing-Frame is more convenient in use and obviates all the trouble of mechanical construction.

Combination Printing

In combination printing the employment of roll film offers advantages over glass plates which are a consideration in practice. Highly contrasted scenes, such as a part of a black interior against a light outside view, can be treated by a method of double exposure, and this way of combining the results. The image of the light part of the picture, which has been over-exposed in the one film, is

removed by reduction, or stripping off the film. In the less-exposed film the light part of the scene only will appear; should, however, a faint image of the darker part of the picture appear, it need not be removed, it will serve to strengthen the detail in the first film. Superimpose the two films in exact register and the combined negative can be printed in the usual manner.

Copying Curled Negatives

When a print is wanted quickly from a newly made glass negative, it is a common enough plan to soak it in one or two changes of alcohol put in a current of air, or blow upon it with a pair of bellows, and have it dry in half an hour. This plan is entirely to be avoided in the case of film negatives, as, if so treated, they curl and pucker to such an extent that it is impossible to get a print of any sort from them. If by any chance the film worker should have essayed this mode of drying, with its inevitable sequence, he may still get a print by putting the film between two glass plates, and, placing it in a copying camera, get a developed print fairly sharp if he stop the lens down pretty freely. We have seen a first-rate print from a hopeless wreck of a film negative obtained by care in this way.

Masking Film Negatives

A narrow, plain margin between the photograph and its mount will often improve the appearance of a print. To mask a film negative, in order to produce this effect, gummed passepartout binding of a dark color is suitable. To proceed: attach the film to a drawing-board with two drawing-pins, using a tee square or a straight edge, to insure the perpendicular lines on the negative being parallel to the sides of the board. Place a piece of white paper beneath the negative so that this adjustment may be facilitated. Cut two pieces of the passepartout binding from the roll, one the length and the other the breadth of the negative. Divide these strips down the middle. Moisten the four strips and, with the tee square as a guide, affix one in position on the negative. Go around the other three sides in the same manner, moving the drawing-pins if necessary. To prevent displacement, there should be not less than two drawing-pins in the film at the same time. When the strips are

fixed on the four sides remove the drawing-pins, place the negative on a smooth surface, film side down, and with a piece of soft fabric press the back of the negative to insure perfect adhesion of the strips. Place the negative under pressure until dry, when it can be trimmed with scissors if any part of the film extends beyond the margin of the mask.

Varnishing

Film negatives—all celluloid negatives—should be varnished. Surface imperfections, such as pin holes and scratches, should be spotted out before this is done. Crimson-lake moist water-color answers the purpose, the pigment being applied with a fine sable brush. If the surface of the film is rough and gritty, re-wash and dry it. A varnish for cold application is prepared by dissolving 10 grains of celluloid in 2 ounces amyl acetate. The solution should be stored in a closely corked or glass stoppered bottle. The film may be covered with the solution by means of a brush, and drying allowed to take place spontaneously.

Paper Negatives

Paper negative-making is popular with a few workers, and deserves brief mention in a monograph which professes to treat of all aspects of negative production on flexible supports. The present writers have frequently made negatives on ordinary bromide paper placed behind sheets of clean glass in the ordinary plate-holder, giving on brightly illuminated scenes so brief an exposure as one-tenth of a second. It is commonly supposed, and often taught, that negatives so made are required to be made translucent by oil or similar agency in order to get the best possible prints from them. This is not essential if the paper used be of a closely woven texture. Nor is any radical departure in developing procedure necessary, if care be taken to choose a non-staining solution, such as rodinal, metol, or amidol. Pyro, if well preserved, is a very suitable developer for negative paper. The operations of fixing, washing, etc., do not differ from film work, the paper being best dried by leaving it in contact with a sheet of glass or other smooth surface, when the negative will peel off in due time

Storing Film Negatives

Film negatives, whether roll or flat, occupy little space in storage. They should be kept flat under pressure—in empty plate boxes, under a piece of plate glass larger than their dimensions; between the leaves of an album; or in negative envelopes, or files which are specially made for the purpose. It may interest the readers of this PHOTO-MINIATURE to learn that the keeping properties of rollable and flat film celluloid negatives do not suffer by comparison with glass negatives. We have both kinds of negatives on celluloid made over sixteen years ago. They are as good as on the day when they were developed and dried. We hope the film negatives made by the present reader will, sixteen years hence, merit the same praise. Assuredly they will if the teachings of this monograph have been laid to heart. Much depends, it will be inferred, on the way in which they are stored. The following system is an adaptation of the book-storage idea: Take an ordinary sheet of stiff brown paper, such as is used for packing purposes, fold and cut it into strips 8 x 10, for quarter-plate films. Stitch these together in the form of a book, say fifteen strips, making a book of thirty leaves. Procure a supply of brown paper negative envelopes and paste them down by the corners, side by side, on alternate pages, two envelopes to a page, 4 x 5 envelopes for quarter-plate films. Store two films in each envelope, number the envelopes and index them. On the opposite alternate pages rough prints of the negatives in the envelopes may be pasted and numbered. Such a book will lie flat and the envelopes will preserve the films from dust and scratches. The book will have a storage capacity of 120 films. Another plan is to procure a quarter-plate album, containing about twenty-five stout cardboard leaves, 4½ x 6½, or thereabouts. This can be adapted to hold 400 pocket-kodak, 200 folding pocket-kodak, or 100 quarter-plate film negatives. If the album is intended for 400 pocket-kodak films, cut 100 strips of tough paper one inch wide and six inches long. To do this, place six or seven sheets of paper, one on top of the other, and cut them all at once. Cut the strips exactly the same size and stick them in the album in the

following manner: Starting from the left of the strip, gum the first half inch, miss the next 2½ inches, then gum another half inch, and missing again 2½ inches, gum the last half inch. Now stick it horizontally along the first page of the album, three-quarters of an inch from the top, taking care that it is parallel with the edges. Two and a quarter inches below this, a second strip should be placed in exactly the same manner. Smooth both down with blotting-paper and subject the page to pressure for a few moments. Repeat the operation on every page and when quite dry the album is ready for the films. Each strip forms, with the cardboard leaf, two "pockets" 2¼ inches long and 1 inch deep. Number the pockets. Two negatives, placed film to film, can be safely stored in each. An index should be provided.

Defects and Remedies

Unevenness of development, with patchiness of density, is probably caused by the films not being kept moving in the developer. **Light bands** down the centers of the films may be caused by allowing the film, during development, to float on the top of the solution instead of evenly immersing it all over. **Circular spots** lighter than the surrounding portions are due to air-bells forming on the emulsion side of the film. To prevent these and the previous defect, keep the films on the move during development. **Yellow stains** in the clear portions of the negative may be due to (1) unfixed silver, (2) the use of caustic alkalies (potassium hydrate or sodium hydrate) in the developer. In the first case refix in a slightly acid fixing bath, in the second try reduction in Farmer's solution—hyposulphite of sodium fixing bath to which a few small crystals of red prussiate of potash have been added. **Reddish brown stains** on the film when dry are probably caused by exposure of the film to white light during fixation; remedy, Farmer's reducer as aforesaid. **Frilling** of the gelatine film is caused by too high a temperature of the solution (which should never exceed 60° to 65° Fahr.), or excessive quantities of caustic alkalies. **Uneven fixation** resulting in circular marks on the film is caused by the film not having been well immersed in the hypo solution. **Scratches and markings** in the film

may be due to rough handling of the films in the solution and developing too many at once. **Adhesion of the films** during drying will cause the gelatine to become torn. They should be pinned up with sufficient space between them, in a room where there is a good current of air. **Pinholes** are caused by dust on the film during exposure or development. **Bubbles** are caused by air in the developer or froth upon it, or by uneven flowing of the solution. **Fog** on the films may be due to an unsafe dark-room light, a defective camera, over exposure, forced development, or to improperly kept film. **Lineature markings** on the film are sometimes possibly caused by the rollers over which the film travels from one end of the camera to the other. Before loading see that the rollers work quite freely. In removing the film double the black paper at the end in order to be able to open it very easily without a sharp instrument and to avoid making a hole in the film. Pulling the paper too tightly before gumming will produce a scratch when a particle of dirt lies between the paper and the film. **Patches of uneven density** on the films are frequently caused by using a rapid action developer and by placing a number of films in one dish. Slow developers are preferable for the work.

BOOKS

How and What to Photograph with Films. By John A. Hodges. 1904. 120 pp. illustrated. Cloth, 50 cents.

Photography with Roll Films. By J. McIntosh. 1903. 196 pp. illustrated. Cloth, 50 cents.

Notes and Comment

THE PHOTO-MINIATURE for June (No. 90) which will be published on May 25, will treat of "Telephotography." It is exactly seven years since the subject formed the theme of a Miniature; to quote Disraeli "many things have happened since then"—so many, indeed, that the forthcoming number will consist entirely of new matter save and except where a reference to general principles is necessitated. Amongst other introductions, and modifications of the telephotographic lens, that have been made between 1901 and the time of writing must be mentioned the Adon, the Junior Adon, new tele-attachments by Zeiss, Goerz, Steinheil and other opticians, the Bis-Telar, the Euryplan, and a variety of apparatus and accessories for the work. Morever, the making of negatives by telephotography has increased to a very large extent so that the time is ripe for a new number on the subject. We confidently anticipate a wide demand for the June PHOTO-MINIATURE—the first of the modern series to be on time.

A word with the reader, the advertiser, the dealer, and the wholesale distributor of THE PHOTO-MINIATURE, all, like ourselves, directly interested in the growth and success of the publication. An erroneous impression appears to have got abroad that an occasional repetition wholly or in part of a title already used in the series is indicative of a paucity of subject matter, and that we must of necessity be telling a twice-told tale when we bring out a new number on an old theme. This is not the case. Some resembleness to titles already used may be unavoidable. This is not our fault but that of the terminologists. Besides, our titles must be short, expressive and catchy—so that he who runs

may read and understand them, and buy the book. We repeat: *And buy the book.* Once bought, it is read from cover to cover, constantly referred to, and carefully preserved. And of no other photographic publication in existence can all this be said with equal truth as of THE PHOTO-MINIATURE.

So much for titles. Now as to subject matter. Recently THE PHOTO-MINIATURE has treated of "Flashlight Photography," "Carbon Printing," "Bromide Enlarging Made Easy," "Defective Negatives," and "Photography with Film." It is true that the titles of these monographs resemble, more or less closely, those already used in the series. It is also true that (1), the new monographs replace those that have been retired or are out of print; and that (2), the matter in them is almost entirely new throughout. This is a point we would strongly impress upon all concerned. THE PHOTO-MINIATURE is always new and up-to-date. It is an old theory of ours, and practical experience confirms the theory, that there is an entirely fresh public in photography every seven years. That new public is always with THE PHOTO-MINIATURE. Happily, so is the old public which has been our loyal and unwavering supporters these last nine happy years. To these and to all, then: to reader, advertiser, and distributor alike we would wish to say that our outlined program for the future of THE PHOTO-MINIATURE includes a long list of attractive subjects, freshly and brightly treated, and we confidently rely upon their kindly cooperation in extending the scope of the publication and its sphere of influence.

Upon his retirement from the general managership of Kodak, Limited, London, the staff of the company presented Mr. George Davison, with a gold watch in recognition of the pleasant relations he has had with them for over twenty years. Mr. Davison, we understand, retains a position on the directorate of the company, to which his experience and abilities should be of great

service. We wish him many years of happiness in his new career of greater freedom and less responsibility. We hope to hear of him occasionally as participating in the work of the Blenheim Club, the Photographic Salon, the Society of Arts, and the other institutions with which he was identified. And why not the Royal Photographic Society?

Visitors to New York will find many things of interest awaiting their inspection at the new offices of the Voigtlaender & Son, A. G. Optical Works, in the Brunswick Building, at 225 Fifth Avenue, just off Madison Square. The complete line of Voigtlaender hand-cameras, new to this country, but long famous in Europe, makes special appeal to those of critical taste in hand-camera construction. They are almost wholly made of metal, and combine elegance of appearance with lightness and rigidity, being fitted with this firm's well-known Heliar and Collinear lenses. New catalogues of both cameras and lenses are now ready and will be mailed to any address on request.

An amateur of note, whose prints are generally admired as the product of unusual technical skill, confided to us a few days ago that latterly he had used the Seltona papers almost exclusively, and found them remarkably elastic in their range of effects. These papers are imported by J. L. Lewis, 379 Sixth Avenue, New York, and are well worth a practical acquaintance.

We are asked to advise our readers that Mr. H. H. Holmes, formerly associated with the Bausch & Lomb Optical Company's New York office, at 225 Fifth Avenue, has severed his connection with the company.

W. Schiller & Co., the progressive dealers of St. Louis, Mo., advise us that they are occupying new and more spacious quarters at 6 South Broadway, where

their large and varied stocks of staples and photographic novelties can be displayed to better advantage than was possible in their old location.

That the interest in the Lumière Color Process grows is seen in the largely increased demand for the two handbooks describing the working of this method, viz.: Brown and Piper's "Color Photography by the Lumière Method," 15 cents; and Bayley's "Real Color Photography," 50 cents. The Lumière autochrome plate (Lumière N. A. Co., New York) has recently been reduced in price, and the process is being widely adapted by professional and commercial photographers.

A big convenience in the separate development of films, as well as the washing of numbers of small prints, is the Jay-Nay clip, imported by George Murphy, Inc., New York, and sold at a dollar per dozen. When once the Jay-Nay clip and its many uses become known among amateurs and professionals here, it will speedily become as indispensable as the famous kodak push-pin—without which no self-respecting film-worker will attempt the developing or drying of cut films. Since their introduction, a year ago, no other single item in the editorial dark-room has seen harder service than the Jay-Nay clips, and we heartily commend them to our readers as a good thing.

Every one who has attempted the more or less troublesome methods of intensification with mercury will welcome the announcement that the Velox Re-developer is as effective a means of intensifying negatives as it is for producing sepia tones on Velox papers. Try it on your next batch of under-developed films.

Instituted by Professor F. A. Waugh, and originating in his wish to show his classes in landscape gardening what there is in landscape which appeals to an artist,

there was held in the past month, at the Massachusetts Agricultural College, Amherst, Mass., a salon of landscape photographs. It was under the management of the Department of Landscape Gardening. There were eighty-four exhibits, amongst the contributors being Professor Waugh himself, Russell W. Taft, Henry Hall, Miss Fedora E. D. Brown, J. Horace McFarland Co., Wm. H. Zerbe, W. T. Knox, and others. We are pleased to learn that the exhibition was a great success, and that it elicited very high commendation from the visitors, who appreciated in marked fashion these camera pictures of nature in some of her many moods and manifestations.

Willoughby's new bargain list (No. 118), obtainable on request, from Chas. G. Willoughby, 814 Broadway, New York, offers some remarkable lines of Graflex cameras, and other cameras, at persuasive prices.

Faults in Negatives, is the title of a 20-page booklet, which describes and illustrates the faults most commonly met with in negative-making. As prevention is better than cure, this exposition of the do's and don'ts of the subject should help the amateur to save his plates and make good photographs on them, instead of spoiling them by carelessness or ignorance. The booklet is to be obtained of the Imperial Company's American agent, G. Gennert, New York and Chicago, and every amateur should have a copy of it.

The well-known opticians, C. A. Steinheil Söhne, Munich, Bavaria, of which house the sole agents for the United States are L. W. Levy & Co., 580–582 Broadway, New York, have issued a new price-list of photographic lenses and accessories. Therein are given particulars of their Unofocal series of lenses *f*/4.5; the orthostigmat series, *f*/6.8 and *f*/10; the Antiplanetic and Antiplanatic group, landscape, wide angle and copying lenses; telephoto lenses, and many other opti-

cal instruments for use in photography. We note that the house of Steinheil was established so long ago as the year 1855. A copy of this catalogue should be in the hands of every admirer of high-class photographic lenses.

Years ago, when the present writers began a practical acquaintance with gelatine dry-plate work, Schering's pyro was the developer almost generally employed, and the quantity of it we used in development was so considerable that, until the preservative came into general use, our fingers were seldom without that accusing stain which stigmatized us as devotees of the Art. Notwithstanding the introduction of other developers, the popularity of pyro, we perceive and hear, not only shows no abatement but is constantly on the increase. A pyro-developed negative is invariably a good printer, and therein, perhaps, lies the secret of pyro's undiminished success in dark-room work. It can be understood, therefore, why such a standard product as Schering's pyro maintains its hold upon the affections of so many experienced workers and is popular with recent entrants into the photographic field.

"At last!" is the exclamation extorted from us by the introduction of the Eastman Plate Tank, a piece of apparatus the coming of which we foreshadowed in our number on "Time and Tank Development." We do not hesitate to predict that the Eastman Plate Tank will do much to simplify, and at the same time revolutionize, dark-room practice by reducing development to a matter of measurable exactitude. The new tank consists of a metal solution-cup, with tightly fitting cover, a rack for holding twelve plates or less, and a block for loading the plates into the rack in the dark-room. When the exposed plates are loaded into the rack and placed in the tank in the dark-room, the tank-cover is fastened upon it. The plates having been placed in the developing solution, the time is noted, and a hand on a dial on the front of the tank is set to indicate the time when devel-

opment is complete. The tank is also usable for fixation. The Eastman Plate Tank should be much in demand by professionals as well as amateurs.

Mention of the Blenheim Club gives us the opportunity of reminding readers of THE PHOTO-MINIATURE that this body absorbed a considerable percentage of the members of the old London Camera Club, which went out of business in the fall of 1905. The Blenheim is situated in Saint James Square, one of the most aristocratic centers of London, and holds monthly lectures on photographic subjects during the winter months. It includes several hundred amateur photographers on its membership roll, and makes a strong feature of the social element. It perhaps ranks as the principal amateur photographic center in the world, and we hope it will continue to be successful, and defy the dry rot which appears to be attacking most photographic institutions.

Mr. P. R. Salmon, F. R. P. S., formerly editor of *The Photographic News*, and latterly editor of *The Photographic Dealer*, has, we learn, severed his connection with the latter publication and is now a journalistic free-lance and photographic expert.

Duffin & Co., dealers in photographic goods, Winnipeg, Canada, advise us that they have formed themselves into a joint stock company. Their premises have been largely increased and extended and the company will now carry the largest stock of photographic material in Western Canada. Duffin, Limited, has our best wishes for success.

The editor of *The South African Photographic Journal*, Cape Town, South Africa, asks us to draw the attention of exhibition secretaries to the fact that he will always be pleased to receive a supply of entry forms for

distribution amongst would-be competitors in South Africa. He complains of some neglect in this matter and we hope energetic secretaries will hasten to remove his cause of complaint. The second number of his journal reaches us at the time of writing. It is an excellent 16 pp. quarto production with many trading advertisements and a distinctly pictorial aspect. We are pleased to read that 2,000 copies of No. 1 were sold out on the day of publication.

G. Gennert, New York, advises us that he is now importing the Austin Edwards rollable film for hand cameras. The film has been known in England for five years as the Ensign film. It is non-curlable and of great speed. The film is sold at the usual prices.

Newton & Co., 3 Fleet street, London, England, one of the oldest firms of opticians in the world, send us their latest catalogue, a production of nearly 700 pages, dealing with a great assortment of projection lanterns and apparatus, lantern-slides and lecture sets and scientific instruments. This house was established in the year 1704, the year before the great Sir Isaac Newton was knighted. This catalogue is obtainable for 12 cents, plus postage, and it should be in the hands of every one interested in high-class optical projection.

Mr. John H. Avery, the well-known photographer, who, until comparatively recently, was specially attached to the Court of Morocco in the capacity of special instructor in photography to the Sultan, and whose work attracted great attention in the press, is now the Indian agent for the plates, papers and films of Wellington Ward, Elstree, England. From an interesting letter sent us by Mr. Avery we learn that THE PHOTO-MINIATURE is extremely popular in Bombay and the up-country towns. In the matter of photographic preparations, Mr. Avery finds the Indian public somewhat conservative, but he reports great progress in his work

of converting photographers to modern ideas. Mr. Avery's address is 49, Hornby Road, Bombay. We wonder if John H. remembers the Easter photographic outing we had with him and others in the Vale of Dedham and Constable's country a few years ago.

The mysteriously advertised Donisthorpe process, to which we referred in last month's PHOTO-MINIATURE, appears to be a method of printing without light. The following is a brief description of it: The negative to be printed from is placed in a hardening bath containing vanadium. After being rinsed it is treated with a solution of a dye. A sheet of plain gelatinized paper having been soaked in water, the dyed negative is laid face upward on a sheet of glass and the gelatinized paper brought in contact with it. Then the paper is stripped from the negative, treated with methylated spirit, dried, and the print is finished. The negative may then be redyed and another print made from it. From the reports published in our British contemporaries, prints resembling good results on P. O. P. are obtained by the process, which is said to have great possibilities before it.

We are informed that our London contemporary, *Focus*, ceases independent publication on May 6, having been purchased by the proprietors of *Photography*, with which publication it will be amalgamated, under the editorship of Mr. R. Child Bayley. There is also a fairly well authenticated rumor that *The Photographic News* will be absorbed by *The Amateur Photographer*, but we give this information under all reserve, as our French neighbors have it. Coupled with the sudden cessation of *The Practical Photographer*, these changes in British photographic journalism appear hardly less remarkable than those which have recently taken place in a similar field on this side of the Atlantic. Meanwhile THE PHOTO-MINIATURE is rapidly nearing the publication of its One Hundredth Number—a unique record in the journalism of photography.

The Folmer and Schwing Company, Rochester, N. Y., have, in the 3A Graflex Camera, provided photographers with a novelty which will undoubtedly be an outstanding success of the summer season of 1908. They have taken the well-known Graflex camera and grafted on to it, as it were, the convenience of roll-film photography. The practical result of this amalgamation of ideas being that the 3A Graflex camera takes the 3A Kodak film, of the size 3 1/4 x 5 1/2. Thus, in the one camera, the worker possesses the convenience of a high-speed focal-plane shutter, a full size reflex finder image right side up, and rollable film,—a unique combination in modern photographic work. The 3A Graflex is destined to be widely used this season, we are persuaded, and the amateur may be well recommended to make himself acquainted with its excellent features.

We are requested to announce that a photographic exhibition, under the patronage of Her Majesty the German Empress and Queen Auguste Victoria, will be held at the city of Posen in August and September next. The programme, which will be ready shortly, will be forwarded on application to Herr Karl Schwier, President of the German Photographic Union, Weimar.

In addition to the new branches which they have recently opened in the United States and elsewhere, the Ansco Company, of Binghamton, N. Y., ask us to state that they have also established a Canadian branch at 30 Wellington street West, Toronto.

There has been issued the prospectus of an International Photographic Exhibition to be held by the Amateur Photographic Society of Amsterdam from August 1-31, 1908, in the Municipal Museum, Amsterdam. Only such work will be accepted as shows good technical qualities and possesses an artistic character. No charge will be made for wall space. Applications for entry blanks should be made before June 1 to "A.

Van Dijk, the Secretary of the Amateur Photographic Society, Office of the Exhibition of Photographic Art, Spin Corner, Handboogstraat, Amsterdam, Holland," and exhibits must be forwarded to arrive on or before July 15.

After a period of inaction, the Boston Camera Club recently held a successful exhibition of photographs. A new executive, with Mr. Phineas Hubbard at its head, has recently taken charge of the club's affairs, and we hope that a new and long career of usefulness is before it. With a membership of over a hundred, the club should do good work in the photographic field.

The Fourth American Salon was recently exhibited at the rooms of the Wisconsin Camera Club, Milwaukee. Some of the exhibits were sold, and the salon was successful all through. The Wisconsin Camera Club shows commendable signs of activity.

The Universal Colorimeter, the latest invention of F. E. Ives, is described in an illustrated booklet which has just been published by Ives' Inventions, No. 939 Eighth avenue, New York City. This is a device whereby the colors of the objects, transparent or opaque, can be measured in terms of three isolated bands of spectrum colors, and recorded by three numbers, as for instance, red 50, green 5, blue 80, for a certain hue and brightness of purple. If the numbers are always given in the same order, a definite color can be reproduced to the eye for matching in half of the divided field of the colorimeter. The instrument is designed for use by chemists, dyers, paper-makers, printing-ink makers. It is said to form a test for the determination and measurement of color blindness. The instrument consists of a rectangular box, having at one end three juxtaposed apertures covered with color screens, respectively red, green and blue, and one clear aperture, all having adjustable shutters; in the middle, an optical mixing

wheel and field lens with circular aperture and prismatic central division, and at the other end an eye-piece. Those of our readers interested in the measurement of color for industrial purposes should procure a copy of this booklet by applying at the address given.

Books and Prints

All books noticed in these pages may be obtained from the publishers of THE PHOTO-MINIATURE, and will be promptly forwarded, postpaid, to any address on receipt of the publishers' prices as here quoted.

"Studies in Sensitometry II: Orthochromatism by Bathing," by R. James Wallace. (*Reprinted from the Astrophysical Journal, December, 1907.*) A continuation of the paper on this subject published in the *Astrophysical Journal*, 25: 116, 1907, dealing with the valuation of color-sensitiveness in photographic plates.

"The Function of a Color-Filter and 'Isochromatic' Plate in Astronomical Photography," by R. James Wallace. (*Reprinted from the Astrophysical Journal, March, 1908.*) A discussion of the principles underlying the intelligent use of color-sensitive plates and filters in astronomical work.

"A Note on the Relation of Astronomical Secondary Negatives to Their Originals," by R. James Wallace (*Reprinted from Popular Astronomy, No. 153*), calls attention to the differences in contrast and density and frequent shortening of the tone-scale inevitable when astronomical negatives are reproduced by means of contact transparencies for purposes of comparison.

We welcome these three pamphlets as offering an intelligent summary, at least in part, of the research work being done in an unostentatious way by Mr. R. James Wallace, at the Yerkes Observatory. Apart from their special interest to workers in astronomical photography, they abound in suggestive information for photographers and students of photometry and sensitometry.

Before the end of May we are promised a new year-book, *The Photographic Annual, 1908*, incorporating "Figures, Facts and Formulæ of Photography," a reference book which was received with world-wide appreciation upon its first publication a few years ago. Judging by the prospectus at hand, *The Photographic Annual* will afford the most comprehensive reference book in the language, covering all branches of photography with formulæ, tables, short-cuts and methods. The book will be obtainable from all dealers in photographic supplies, in paper cover at 50 cents, postage 10 cents extra.

Das Kopieren bei Electrischem Licht. By A. F. Von Hübl. 20 illustrations, 56 pages, price 1 mark 80. Halle a S.: Wilhelm Krapp. This is one of the publisher's well-known encyclopedic series. It consists of a number of chapters on electric illuminants for copying and enlarging. Various types of arc and other lamps are compared, their areas of illumination are measured, and the value of reflectors, the effect of the length of arc, are subjects that are dealt with. The book is one that addresses itself to the apparatus-maker rather than to the practical worker, though the information it contains will no doubt be welcomed by both.

Lehrbuch Der Projection von Dr. R. Neuhauss. 141 pages, 71 illustrations. Halle a S.: Wilhelm Krapp. Price, 4 marks. A good book on optical projection is sadly wanted just now. Lewis Wright's volume, which was brought out many years ago, is the only volume which handles the subject with any approach to authority and completeness, and it is, of course, somewhat out of date, although quite a reliable source of reference to the main principles of the subject. Neuhauss is *facile princeps* at the theme, and we welcome this second edition of a book originally published in 1901, only regretting that it is not printed in the English language. The book covers the entire field of optical projection, lantern, stereoscopic, microscopic, panoramic, etc., and exhaus-

tively discusses the principles, and describes the apparatus and illuminants. It is essentially a volume for the advanced worker.

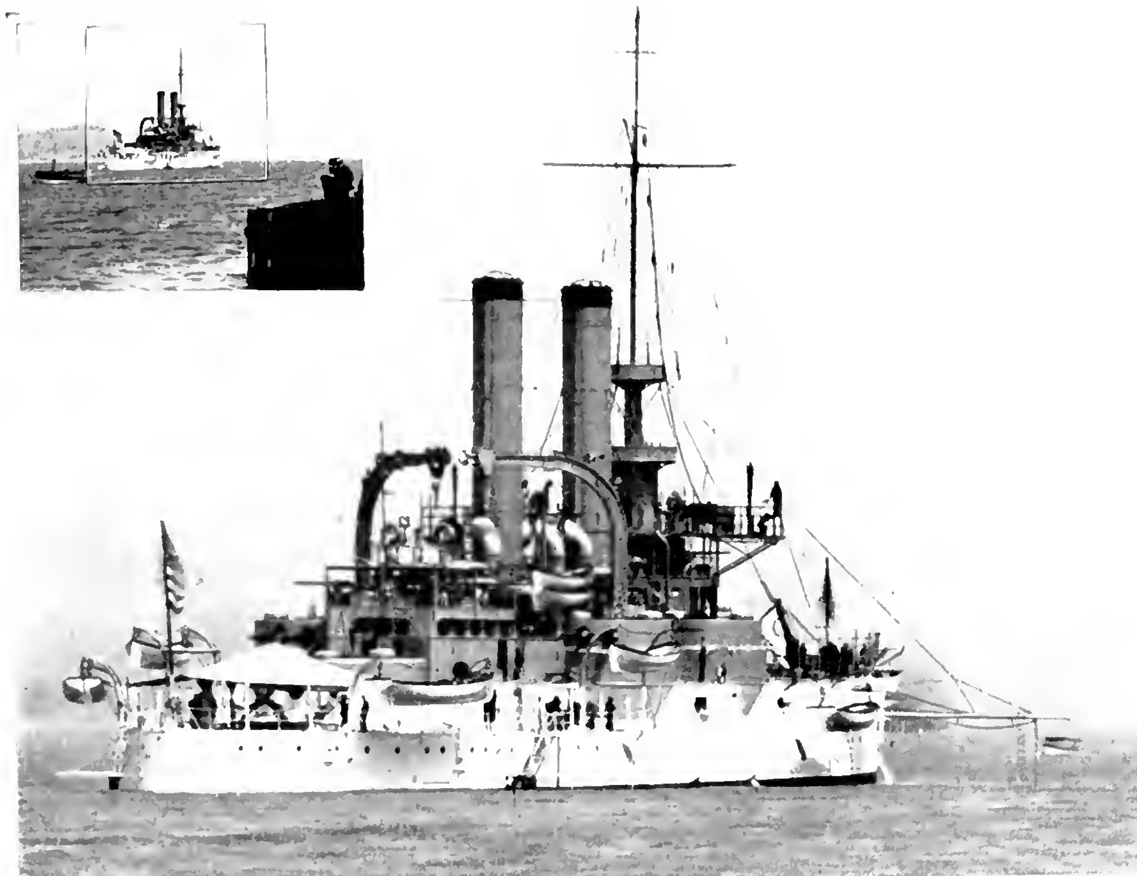
Special interest attaches to *Camera Work* for April, the twelve-page article on Colour Photography being from the pen of Eduard J. Steichen, who describes in some detail his methods of working Autochrome plates. The impetus given to this process in the summer of last year may undoubtedly be traced to Steichen's enthusiasm for it, and the results it gave him. In the number of *Camera Work* before us there are reproduced by trichromatics four Steichen Autochromes of the inevitable George Bernard Shaw, who seems to be uncommonly fond of being photographed ; a vivid houseboat scene ; and a portrait of a lady. The pictures are striking examples of the process. Other features of the number include a statement as to Mr. Steiglitz' "expulsion" from the New York Camera Club, and an amusing skit by Mr. Caffin, entitled "Rumpus in a Hen-House." Assuredly this number of *Camera Work* should be in the hands of every one interested in Autochromy, and nothing would please us so much as to learn that copies of it stood at a premium.

"The Prism" for April, 1908, the Bausch & Lomb Company's exquisite little lens magazine, shines up brilliantly and modestly from a corner of our editorial table. It contains three well-written articles of interest to lens users, and is one of the neatest and daintest examples of typography that have come our way.

We have received a copy of the Library Catalogue of the Royal Photographic Society, 66 Russell Square, London. The catalogue is on sale in the office, price 3*s*., to members 2*s*., by parcel post 4*d*. extra. It is divided into three sections, authors' index, subject matter index and index to periodicals, with an index to the subject matter section. It is a volume of one hundred

and ninety-three pages, printed on one side of the paper only, thus leaving space on which particulars of new books may be entered as they are added to the library. Lists of such new books, we understand, will be printed from time to time and will be obtainable by purchasers of the catalogue. The latter is by no means so satisfactory a production as we could wish to have, as it is neither complete nor well compiled, defects which will no doubt be removed in future editions.

Night Photography. By Robert Dykes. 44 pp.; illustrated. Price 50 cents, post free. New York. Tennant & Ward, 122 E. 25th street. The author of this book has taken as the basis of his material a paper which he recently read before the Edinburgh Photographic Society and some contributions to our contemporary, "The Photographic Monthly." Underneath most of the excellent illustrations are the technical data which were utilized in the making of the negatives, and in the course of the book the author lists a number of subjects suitable for night treatment, and gives directions for the work. It will be appreciated, no doubt, by those who take up this branch of photography. Mr. Dykes finds fault with No. 31 of THE PHOTO-MINIATURE on the subject as "a trifle too American and not sufficiently general." We find ourselves unable to agree with Mr. Dykes' complaint, which, however, both he and we agree is not serious.



Two views of U. S. S. Iowa made from the same standpoint, showing relative sizes of image obtained. Small view made with Goerz Dagor No. 8. Lower view made with same positive lens and Goerz Telephoto lens. Magnification, 8 diameters.

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EDITED BY JOHN A. TENNANT
AND THOMAS BEDDING, F. R. P. S.
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Practical Telephotography

A photographer of natural history subjects was once walking in the country with an inventor of lenses, when the former drew the latter's attention to a bird on a tree some distance away. "Can you not make a lens," said the photographer, "which will give me a good-sized picture of that bird from this distance, without involving the use of a big camera and its cumbersome bellows extension—a small and compact instrument which can be managed without much trouble?" The optician said it was an easy thing to do, and done it was in due course—in the telephotographic lens introduced by Dallmeyer about 1891–2. On another occasion, a photographer and a journalist were touring in the Highlands of Scotland, and the talk was about lenses. "What I want," said the photographer, "is some sort of telescopic lens for getting a large picture of yonder distant hill from this view-point." Acting on this suggestion, the journalist subsequently made from the window of his own home an enlarged view of a distant house (as substitute for "yonder hill") with an opera glass attached to an ordinary camera possessing the usual limited bellows extension. These are bits of unrecorded history touching the beginnings of telephotography as we know it today. The four *dramatis personæ* in order of mention were Dr. P. H. Emerson, Thomas R. Dallmeyer, John Stuart, of Glasgow, and J. Traill Taylor. Of these, Dr. Emerson alone survives to witness the present widespread popularity and use of telephotog-

raphy, himself the author of the first telephotographic portrait ever made.

In this brief dismissal of the historical side of our subject, it is only fair to state that, almost simultaneously with the introduction of the Dallmeyer telephoto lens in England, similar objectives were brought forward by Miethe and Steinheil in Germany and Duboscq in France, not forgetting mention of the "parent of all telephoto lenses"—the Barlow lens of 1834—which, of course, antedates photography itself. Add to this, the appearance a few weeks ago of a quarterly periodical exclusively devoted to telephotography, and our history is right up to the moment.

Distance is no obstacle to success in this class of work. The telephotographic lens supplies a method of photographing objects much larger in scale than an ordinary lens will do, without increasing the size of the camera, or lengthening the bellows, for the work. It is immaterial whether the object photographed is situated ten miles away from the camera, or only ten yards; the practical gain is the same. The apparent size to the eye of the particular object is rendered in the negative by telephotography; with an ordinary lens, its dimensions may be so small that the print is disappointing. As we have seen, it was to overcome this drawback in photography that telephotographic lenses were introduced, and their extending use is proof that photographers appreciate the extra power placed in their hands. Telephotography calls for comparatively little extra expense and the actual photographic work necessary does not differ much from negative-making in the usual way. The photographer who takes up the subject, therefore, need not fear that he will meet difficulties which he cannot easily overcome. The aim of this monograph is to point out that telephotography is comparatively simple when once its fundamental principles are understood.

Uses of Telephotography

Besides amateur and professional photographers, many other classes appreciate the practical value of telephotography in making direct enlargements, in the camera, of near and distant objects. Naval and military officers, engineers, surveyors, architects, astronomers, naturalists, are but

a few of the many that might be cited in proof of this statement. Early work in telephotography was chiefly directed toward showing what very fine long-distance views could be made with the lens; in more recent times, however, its uses for photographing near objects on a large scale have attracted notice, and it is to this branch of work that we wish to direct particular attention. For the lens exercises a three-fold function: It is, first of all, a long-focus lens; secondly, a lens of variable foci, that is, a number of lenses in one; and, thirdly, it gives correctness of drawing in near objects, such as portraits and buildings; or, in other words, it suppresses the distortion or exaggerated perspective seen in photographs taken with lenses of too short focal length, by enabling the photographer to interpose what amounts to a greater distance between the camera and the subject photographed, or between the lens and the sensitive plate, which, in practice, amounts to much the same thing as increasing the focus of the lens.

Size of Image

To understand how a telephotographic lens does all this, let us first see how an ordinary lens acts in taking a photograph. We will suppose the reader to have a camera with a bellows extension of eleven or twelve inches; a five-inch lens on its front, and a focusing screen at the back. Open the stops of the lens; focus it upon some prominent object a few yards away, and measure its size on the ground glass. The image of the object measures, we will assume, one inch. Now, for the five-inch lens on the camera front suppose one of ten inches focus to be substituted, and the same object focused and measured. The size of the image will now be two inches, or exactly double that given by the five-inch lens. From this it is plain that the size of an object in a photograph is purely a matter of the focal length of the lens used, a fact which is an underlying principle in telephotography. We must next find out what is meant by the term focal length as applied to a lens.

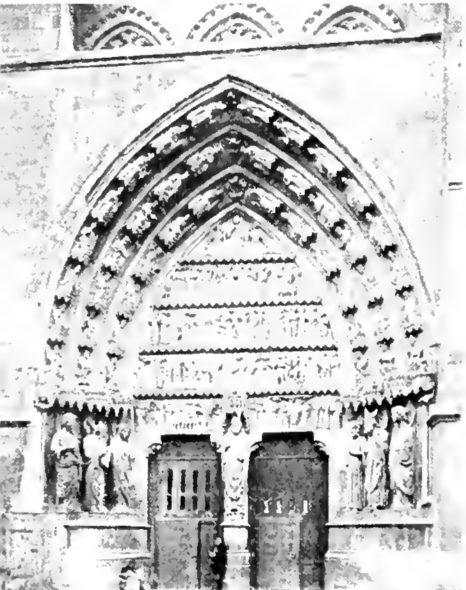
Focal Length

The focal length of a lens is, roughly, the distance from the back surface of the lens to the ground glass of the camera; strictly, it is not so, the distance being properly

measured from the optical center of the lens, a position which varies with the particular type of lens. It may either be within the lens itself or quite outside it. The optical center of a lens is best defined as an imaginary point in a lens, simple or compound, arrived at by calculation, from where its actual or equivalent focus is measured. The meaning of the term equivalent focus is easy to understand if we realize that all lenses of the same foci, or focal lengths, give images of the same size, but as the optical centers of the lenses vary in position, so also do the necessary camera extensions. For example, the optical center of a double convex lens is in the middle of that lens; in a plano-convex lens it is just outside the convex surface; in a meniscus or concavo-convex it is well outside the convex side; in a double lens, such as a rectilinear or anastigmat, it is conveniently, though perhaps not quite accurately, assumed to be at the stop opening; whilst in a telephotographic lens it is far outside the first surface of the front lens. This variation in the position of the optical center of a lens tells us, amongst other things, why, with a camera of comparatively short extension, it is possible to get, with a telephotographic lens, the image of an object as large as we should obtain with an ordinary lens of great focal length in a camera of considerable extension. To put it objectively: Suppose that with a positive lens of seven inches focus and a suitable negative lens we obtain an image of an object magnified eight times, we shall be using the telephoto lens at an equivalent focus of fifty-six inches, which means that with an ordinary long-focus lens that would be the extension of camera required to get the same-sized image as the telephotograph. In the latter case, however, the camera extension would not be anything so great, as we shall proceed to show.

Positive and Negative Lenses

To arrive at the explanation of this striking fact, however, it is necessary to enquire yet more closely into the action of simple lenses in the formation of an image. A double convex lens, if mounted on a camera front, will pass rays of light to form an image on the focusing screen, but the picture will not be sharp, because one



Examples by Ernest Marriage, showing magnifications of moderate and high powers, advantageous in photographing architectural details.

1. North Door, Rheims Cathedral. Beck-Steinheil lens, 7-inch focus.
2. Detail of No. 1, moderate power magnification—4.82. Beck-Steinheil Telephoto lens.
3. Detail of No. 1, high power magnification—11. Beck-Steinheil Telephoto lens.

simple lens cannot bring the rays, which are of unequal length, to a sharp focus on the picture plane; to get such a result a compound lens is necessary, and then the longer rays will come to a focus at the same points as the shorter rays, and so the image will be sharp. The necessary correction is effected by placing a concavo-plano lens in perfect optical contact with the double convex lens, a combination resulting which will produce a well defined photograph. This effect is produced by opposing one defect by another, or, as it is otherwise described, by combining a positive lens with a negative. A positive or convex lens produces a real image of an object placed in front of it by converging the rays of light on to the sensitive film surface; a negative lens has only a virtual focus and will not produce a photographic image; positive lenses converge the rays; negative lenses diverge them: it is a case of bending them in and bending them out. It will now be more clearly understood how, if a positive lens converges or bends rays of light unequally, the juxtaposition of a negative lens will diverge or bend them outwards, and the sum of the matter is that the rays are united to form a common focus. This is what is meant by achromatism in lens construction: a simple positive lens shows color fringes on the focusing screen, being non-achromatic, or uncorrected for color; but, by combining with it a negative lens, an achromatic lens results and there will be no color fringes in the picture, which will be sharp. The terms "positive" and "negative" have important meanings in telephotographic lens construction, and it is essential that those meanings should be plainly understood from the foregoing brief explanation. Any lens which gives a sharp image on the ground glass is properly a positive lens. If such a lens is placed at one end of a suitable tube, while at the other end there is fixed a negative or diverging lens, the latter will intercept and enlarge the image formed by the front or positive lens, and the practical advantages of the combination will be a considerable increase of the focal length of the telephoto lens as compared with the positive lens alone; the displacement of the optical center of the telephoto lens to a point outside the positive lens; a shorter camera extension

than would be necessary with an ordinary positive lens of the same equivalent focal length as the telephoto; and the combination in the one lens of a series of lenses of different focal lengths. Thus, the addition of a negative lens to a positive provides the photographer with what has been termed a battery of lenses of variable foci, so that he is not limited to one particular kind of work or size of negative. In former works on telephotography not sufficient stress has been placed on this important fact; and it is only of recent years that photographers have become alive to the valuable range of powers which the telephotographic lens places in their hands. It is not one lens, but many lenses varying in focal length.

Angle of view

The telephoto, being primarily a long-focus lens, is of course subject to the limitations of other long-focus lenses. It suffices to mention one of those limitations here, viz, the included angle of view. Briefly it may be laid down that the greater the equivalent focal length of the telephoto lens the narrower becomes the angle of included subject. If we refer back to the comparison made between the five- and ten-inch lenses in estimating the relative sizes of objects as influenced by focal length, we shall remember that, though the size of the object focused on was doubled by the longer-focus lens, yet the amount of subject included in the picture was less than in the instance of the five-inch lens. In the latter case we got more of the subject but smaller in size all over; in the case of the ten-inch lens less of the subject but larger in size. Enlargement of image therefore in telephotography is accompanied by compressing the field or area of the subject. It is necessary that this point should be made clear and grasped by the reader. The unthinking sometimes regret that long distance telephotographs do not exhibit a more panorama-like effect; the reason will now be obvious. But though the angle of view with a telephoto lens is necessarily narrow, it is nevertheless constant for all magnifications. It varies in size directly with the magnification or length of focus of the lens, being precisely the same at 2, 4, and 8 magnifications. The lens acts by forming a circle of illumination on the plate; and the following table shows what the diameter

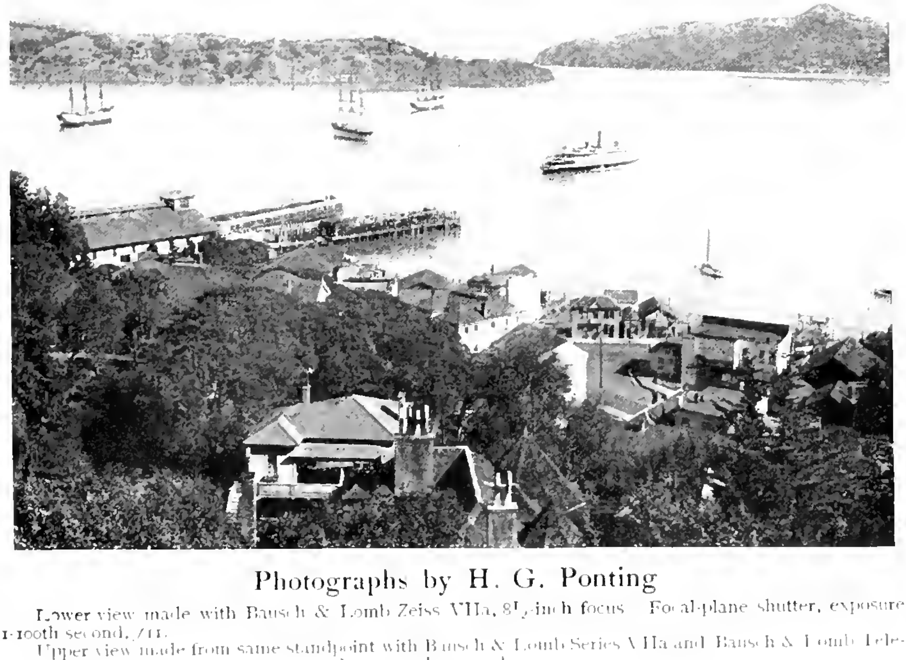
of the circle of illumination must be in order that a plate of a certain size must be covered.

Size of plates	Circle of illumination
$3\frac{1}{4} \times 4\frac{1}{4}$	$5\frac{4}{10}$ inches
4×5	$6\frac{4}{10}$ inches
5×7	$8\frac{6}{10}$ inches
8×10	$12\frac{3}{4}$ inches

If a certain part of a subject, such as a view or a building, is included in the complete circle of illumination, an increase or decrease of the magnification will also increase or decrease the size of the image and the circle of the illumination, but it will not alter the total amount of the subject that is included; consequently, while the angle is small it is constant for all foci of the telephoto. A size of plate should be chosen which receives the whole of the circle of illumination; if too small a plate is chosen, then obviously the outer parts of the circle or picture will be lost. The limitation and constancy of this angle of view or field brings out what is one of the best features of the telephoto, namely, its pleasing rendering of the drawing of near or distant objects, which are thus shown in true perspective. A common fault in ordinary photography is the use of too short focus lenses, with the consequent result that the picture is shown distorted or in too violent perspective. Nowhere is this more convincingly shown than in many studio portraits of seated figures, in which the hands and feet are sometimes shown disproportionately large. The reason for this is that the lens was of too short focal length; a longer-focus lens of the ordinary, or of the telephotographic kind, would give a more natural and proportionate rendering of the parts of the figure. This point, of special importance to the portraitist, is fully developed in an illustrated chapter of Dallmeyer's "Telephotography."

Depth of Focus

It will be useful for the beginner in telephotography to bear in mind that the depth of focus (or depth of definition) in the negative is dependent on the aperture or stop used in the positive lens. For example, if the positive has an aperture of *f* 6, and the magnifying power of the telephoto is 4 times, then it will have one-fourth of the depth of



Photographs by H. G. Ponting

Lower view made with Bausch & Lomb Zeiss VIIa, 8½-inch focus. Focal-plane shutter, exposure 1-100th second, f/11.

Upper view made from same standpoint with Bausch & Lomb Series VIIa and Bausch & Lomb Telephoto attachment. Magnification = 5. Exposure ½ second.

focus for distant objects possessed by the positive alone; the higher the magnification the less the depth of focus. This depth can be increased by stopping down the original positive; but of course this means diminishing the power of the illumination and consequently prolonging the exposure. This is a matter which the photographer must settle for himself by a little practical experience; obviously where a long exposure can be given, say, in the case of an interior, where for photographic purposes the worker has the place to himself, then the smaller the stop the finer the definition and the greater the depth of focus will also be.

How Negative Lenses Act

We should now be in a position to consider what governs the size of the picture in telephotography. It must be remembered that the telephoto besides being a lens of great focal length is also one of variable foci, and consequently the photographer has a choice of size. This is determined by the negative lens, which is a movable factor and can be racked nearer to or farther from the positive lens at will. There is a relationship between the positive and negative lenses which has an important bearing on the point; that relationship is their respective focal lengths. A proportion that will serve to make the point clear at this stage is as 2:1—in other words the use of a 6-inch positive with a 3-inch negative. Suppose a distant object, a building a mile away for instance, be focussed upon the screen with the 6-inch positive alone, and the size of the image measured. With the 3-inch negative lens attached to the positive at a distance from it equal to its own focus, in other words 3 inches, measure the image again, the bellows of the camera extending to 12 inches. It will be found that the image has been magnified five times; now separate the negative 4 inches from the positive; refocus and remeasure the image, it will be found to be magnified only three times; at 4½ inches, twice, at 5 inches, one and one-half times. Thus the nearer the negative lens is to the positive the greater is the magnification, and that the farther it is removed from it the less is the image magnified. Consequently, in telephotography the size of the picture, or its degree of magnification,

depends chiefly upon the focal length of the negative lens, upon its distance of separation from the positive, and upon the relative foci of the two. The separation between the positive and negative lenses varies between the focal length of the positive and that of the negative, the latter being the range of separation; in other words, the negative is placed at a distance equal to its own focal length from the positive, and its focal range lies between that range of distance.

Magnifications and Powers

These two terms are much used in telephotography; a few experiments by the worker will determine their exact meaning. First, as to magnifications: Focus the positive lens alone upon the house a mile away, and then mark the position of the camera front, or the back, if it racks to and fro, on the baseboard. At the same time mark the exact size of the house on the focusing screen. Then add the negative attachment to the positive, and then refocus the camera until the house is twice the size on the screen, and mark the second position of the camera front or back on the baseboard; three, four, five and six magnifications can also be marked in the same way. These magnifications are sometimes called linear magnifications, which merely means that the size of the image on the screen is magnified so many times. But the magnification is not merely linear or in one direction only: it extends over the whole superficial area of the image, so that if a part of the picture occupies a square inch with the positive lens alone, a magnification of four times means that it has been enlarged four times all over, or increased in size to four square inches, and the exposure increased accordingly. Magnification and power are convertible, if not synonymous, terms, for when we speak of low-, moderate-, or high-power work in telephotography we mean proportionate degrees of magnification. The term "power" is more particularly applied, however, to the negative lens and the ratio of its focal length to that of the positive. The shorter the ratio the lower the power; the longer the ratio the higher the power. Thus a 6-inch positive and 3-inch negative ranks as a moderate power; a 9-inch positive and a 3-inch negative, as a high power. As applied to

A—View made with Voigtlander Collinear Lens, Series III, No. 4
Note the portion enclosed in black lines

B—View made from same standpoint as A with Voigtlander Collinear, Series III, No. 4 and Voigtlander Telephoto-attachment No. 4

actual magnifications, anything up to six might be looked upon as moderate; above six as high. There are, however, no fixed standards of classification in the matter.

Working Aperture

An examination of the telephoto image on the ground glass reveals the fact that, in comparison with the picture shown by the positive lens alone with a large stop, there is not the same brilliancy of illumination. The reason is simple: the telephoto lens works with a much smaller stop and so passes proportionately less light. The great advantages of the telephoto are not obtained without some corresponding sacrifices; as we have seen, narrowness of angle is one of them; and smallness of aperture, or stop, is another. But neither in practice interferes with successful work. It is only necessary to know what the actual working stop of the telephoto is, to be able to calculate out the correct exposure. The information is arrived at in this way: The working aperture of a telephoto lens equals the f number, or the stop that is used, of the positive lens, multiplied by the times of magnification. Thus, to take the case of our 6-inch positive and 3-inch negative, giving 5 magnifications: if the stop of the positive when making the exposure is $f/8$, then 8 multiplied by 5 equals 40, and the telephoto lens is consequently working at $f/40$. To the photographer accustomed in ordinary work to using much larger stops this comparative smallness of working aperture in telephotography may seem to be a very great disadvantage indeed; in practice, however, it will be found not to be the case. For one thing, the great rapidity of modern plates and films allows of the use of comparatively small stops; and the nature of most telephoto work is such that extremely rapid exposures are not required—focal-plane-shutter exposures of $\frac{1}{1000}$ of a second and the like, although as we shall subsequently see it is available for some kinds of hand-camera photography. The comparative smallness of the aperture prevents the use of the telephoto-lens in studio work, where great rapidity of exposure is essential in most cases; but the high sensitiveness of modern plates should compensate for this. Portrait lenses with negative attachments can be used at an equivalent focal

aperture or stop of $f/10$, which is not much smaller than many portrait photographers already use.

Definition

One valuable property of telephotographic negatives should be mentioned, viz., the excellence of their definition. In making an enlargement from a negative taken by an ordinary lens, the granularity of the original deposit is also reproduced in the finished picture, which shows a greater or less amount of structural coarseness. Theoretically, a photographic negative should be an impalpable stain; in these days of rapid emulsions it is frequently a granular deposit. By telephotography one avoids the granularity of subsequent enlargement, for we enlarge the principal object in our view direct, and so we obviate the intermediate operation, which coarsens the structure of the image. This feature of a telephotograph is worth noting by those who appreciate fine definition in photographs. Something, of course, depends upon the condition of grain of the plate that is used and the method of development. Extremely fast plates and rapid development favor the production of coarse-grained images. Slower plates and careful development give finer-grained negatives.

Summary of Points

Summing up the introductory points of our subject we first of all see that the size of an object in a photograph is determined by the focal length of the lens used; that the focal length of a lens, or combination of lenses, is measured from its optical center, which is a varying position, and that this focal length decides the necessary extension of the camera. Next we see that a telephoto lens is a lens of compound construction, consisting of (*a*) a positive lens to form an image, and (*b*) a negative lens to enlarge it; that the combination necessarily works at a small stop, and why; that while it gives pictures of near or distant objects on an enlarged scale it includes a comparatively small angle of view in the negative, and that, most important of all, it is the negative lens which influences the magnifying power of the telephoto, converts it either into a long-focus lens pure and simple, or into a battery of lenses of varying foci. If these points are quite clear in the reader's mind, he may safely turn

his attention to the concrete aspect of his subject and set about the making of negatives by telephotography. His first step will be to obtain a telephoto lens and camera and learn their adjustment.

Apparatus

Most probably he already owns a camera and lens; in that case all that he will require is a suitable negative lens or attachment, as it is sometimes called. In exercising this choice the photographer may draw from a wide field, as all the chief manufacturing opticians make lenses for telephotography. Complete telephoto lenses consisting of properly mounted positive and negative elements are listed by Zeiss, Dallmeyer, Beck, Goerz, Steinheil and Voigtländer. Ross makes a special telephotographic tube to which the photographer can attach his own positive and negative lenses. The catalogues of these houses give much information on the subject, and we recommend the photographer to obtain copies of them for perusal. For the positive lens of the telephoto a good objective of the rectilinear or anastigmat type answers all requirements, so that it is not necessary to describe such lenses; the negative element, however, is of greater definite importance from our view-point, and we must, therefore, devote a little special thought to it.

Negative Attachments

The Bausch & Lomb negative lens gives a magnification of from three to eight diameters; it can be used with any good positive lens. The front of the barrel is threaded to receive the positive and the rear end has a flange for attachment to the front board of the camera. The main tube is marked with the degrees of magnification. A similar form of negative attachment, known as the Turner-Reich, is made by the Gundlach Manhattan Optical Company. Voigtländer & Sohn make a tele-negative lens with a fixed tube, which gives a magnification of about two and one-half diameters. The focusing is done either with the camera or the focusing jacket of the positive lens. This firm also attaches a tele-negative, giving two and one-half magnifications to the Heliar Reflex Camera, working at an equivalent focus of seventeen and three-fourth inches, for long-distance work. The positive lens for these attachments is the

Voigtländer Collinear. C. P. Goerz supplies tele-negative lenses of simple form for use on cameras of fixed extension, such as the Goerz Anschutz. With a magnification of seven, the attachment of three inches focus and a No. 1 Celor positive lens covers a whole plate sharply at the fullest aperture. See Frontispiece.

Tele-adapters

Zeiss, of Jena, supplies two kinds of tele-adapters for attachment to an ordinary positive lens. No. 1 is intended for hand-cameras of fixed extension; No. 2 for cameras of varying extension. No. 1 gives an invariable magnification of about four times; No. 2, with bellows extensions of from six to seven inches, gives a range of magnification of from four to eight times. The same firm sends out a simple telephotographic lens of a fixed definite focal length, made in one size only, at a relative aperture of about $f/14$ and a focal length of seventeen and three-fourths inches. It requires a camera extension of six inches only. The lens is for use on near objects only, such as portrait studies, and on a quarter plate includes an angle of 15°.

Choice of Negative Lenses

The beginner may at first be somewhat bewildered by the choice and variety of telephotographic apparatus at his disposal, but with the accumulation of his experience that difficulty will disappear, and he will feel more confidence in picking and choosing his powers or attachments. In selecting an attachment, it is a good plan to have one with an extension tube which will allow of several tele-negatives of various foci to be used in it. If he already owns a 6- or 7-inch positive lens, it is well to commence with a low-power negative, say 1¾- or 2-inch focus. It is preferable to avoid long camera extensions, which is another argument in favor of short-focus negative lenses. It is to be borne in mind that an increase of magnification can be obtained by the use of negative lenses of short focus. With low magnifications, a long-focus negative is requisite to cover the plate and evenly illuminate it. In practice it comes to this, that a short-focus negative will give as many magnifications at short camera extension as a long-focus negative with a more extended draw of the camera. The

ideal condition of things, of course, is a battery of negative lenses for use according to circumstances.

The Telephot

Telephotographs taken in the telephot, an apparatus of novel construction, have recently drawn attention to an instrument which differs somewhat in principle from an ordinary telephoto lens. Externally the telephot resembles a double camera, one instrument being superposed on another. The lower one has the lens mounted in the usual place on the camera front. This lens passes rays of light to an inclined plane mirror in the rear of the camera; this mirror in its turn sends the image to a second mirror, also angularly inclined to the first, and situated in the top camera above the lens beneath. The second mirror reflects the image to a third mirror which is placed in the focal plane at the back of the upper camera. The apparatus is constructed by Boissonnas, Geneva, Switzerland.

Low-power Lenses

When the back combination of an ordinary rectilinear or anastigmatic lens is used for making photographs, we get a single lens of about double the focal length of the entire lens and half its normal working aperture. Thus, if we have an eight-inch lens of which we use the back half, then the focal length of this latter becomes sixteen inches, and with it we can take a photograph of an object twice the size of that produced with the complete eight-inch lens. The stop or working aperture of the lens is also halved in value and so our *f* 8 becomes *f* 16, and so on. This property of double lenses may be regarded in some respects as telephotographic, as it gives a low magnification. In such cases, however, the bellows extension must be sufficient to permit the use of the longer focal length thus gained. Taylor, Taylor & Hobson improve somewhat on the principle. By removing the back glass of a Cooke lens and substituting a special extension lens, the focal length of the lens is increased by rather more than half; at the same time the extra camera extension required is less than if the back combination of a rectilinear is used. Another lens which may be classed among low-power telephoto objectives is the Bis-Telar, made by the Emil Busch Optical

Upper—View made with a rectilinear of 5-inch focus
Lower—View made with a Bis Telar Lens from the same standpoint. Camera extension $5\frac{1}{2}$ inches

Company. This lens is made in foci of seven, ten and fourteen inches; in appearance it resembles an ordinary doublet lens, the front and back combinations being of unequal size and curves. Its largest working stop is *f* 9 and the special characteristic of the lens is that with a short camera extension it gives large-sized images. For example the draw of the camera when using the 7-inch focus lens need be only 4 1/8 inches; the explanation of this unusual-looking fact is probably that by the peculiarities of its construction the optical center of the Bis-Telar is well outside the surface of the front lens, the practical outcome being that as a long-focus lens is used at a short camera extension, a large-sized image is obtained. The lens doubles the size of a distant object as compared with a lens of shorter focus on the camera at the same extension—as shown in the accompanying comparative illustrations.

The Adon The Adon is a complete telephoto lens in itself, but it can also be used in front of any positive lens of the anastigmatic type. It is composed of two combinations: the front a positive lens of 4 1/2 inches focus; the back, a negative lens of 2 1/4 inches. The lens is suitable for folding hand cameras; its equivalent focal length in use is about twice the camera extension plus 4 1/2 inches. The minimum camera extension at which any required size of plate is covered is about equal to the diagonal measurement of the plate: a 3 1/4 x 4 1/4 is covered at an extension of 5 1/2 inches; a 4 x 5 at 6 1/2 inches; a 5 x 7 at 8 1/2 inches. The working aperture when the Adon is used in front of another lens of 5 1/2 or 6 inches focal length, is about *f*/8; with an 8-inch positive about *f* 11. In the following table the *f* values refer to the aperture marked I on the iris of the Adon:

Camera extensions Inches	Focal length Inches	F Value
5	14·5	13
6	16·5	15
7	18·5	17
8	20·5	20
9	22·5	22
10	24·5	24
11	26·5	26
12	28·5	28

Junior Adon The Junior Adon, another form of the lens, is used with the back combination of an ordinary lens on cameras of the folding Kodak type, held in the hand. The front combination is removed from the mount and the Junior Adon screwed in its place. The camera bellows is then extended until the focusing pointer is opposite the special infinity point which has been marked for use with the Junior Adon. The exposure for distant objects is made in the usual manner; for near objects the camera extension need not be altered, but the focus is adjusted by rotating the front lens of the Adon until a number indicating the distance of the object, in feet, is opposite an arrow engraved on the outer tube. To adjust the Junior Adon to a camera, screw it into position on the front of the lens and extend the bellows of the camera as far as possible. Place a piece of finely ground glass in the position usually occupied by the surface of the film. Loosen the small screws which will be found at the back end of the outer tube, screw the tube itself in and out on the fine screw thread until the image of a distant object is sharp, the front lens being screwed home to its infinity point. The small screws on the outer tube are then returned to their original places as firmly as possible.

Tele-Cameras Most stand-cameras and many hand-cameras are available for use with telephotographic work, and some of the manufacturers are responding to an evident desire on the part of the public for cameras specially constructed for telephotographic use. On the ordinary stand-camera, the protuberance of the telephotographic lens from the front is considerable, owing to the length of the tube. Voigtländer & Sohn remove this objection in their new Tele-partition stand-camera, which renders a tele-tube superfluous by attaching the negative lens to a partition wall in the body of the camera. This tele-partition board is controlled by rack and pinion movement, so that, instead of making the adjustment of the negative lens on an external mount in the ordinary way, the tele-partition itself is focused. Externally, therefore, this camera, which is of square form, looks like an ordinary

landscape camera with a positive lens on the front, the negative lens being mounted on the inner board inside the instrument. Zeiss, of Jena, introduce a tele-camera, especially for hand-camera telephotography. The camera is of magazine form, ten to eleven inches in focal length, with a focal-plane shutter and a double plate-holder taking plates of about $3\frac{1}{2} \times 4\frac{3}{4}$ inches. On the camera front is placed the tele-objective which racks in and out in the ordinary way. When not in use it is racked into the body of the camera; when making an exposure it is racked forward and fixed in position with a binding-screw. The lens has an equivalent focal length of thirty-two inches, with a relative aperture of $f/10$; it can be focused from infinity down to two and three-quarter inches. A feature of the instrument is that on the top of the camera, immediately above the focal plane, is fixed a prismatic ocular glass: the half of a prismatic binocular, which, in a small compass, performs the functions of an observing telescope, by the aid of which distant objects can be accurately sighted by the eye and focused in the camera. It is obvious that with a relative aperture of $f/10$, the size of this 32-inch equivalent focus lens must be comparatively great. So it is, for the lens is three to four inches in diameter, and, externally, looks like a portrait lens. The F. & S. Naturalist's Graflex, the Revolving Back Cycle Graphic and the Pony Premo No. 6 are all suitable for telephoto work. Shew, Marion, Houghton and Sinclair, of London, also make long extension stand- and hand-cameras especially for telephotography. For stand work, of course, any good field or copying camera with sufficient bellows capacity can be used.

Tripod Stays

For supporting the camera when at work, the tripod stand should be of such a size that it is capable of bearing a much larger size of camera than is being used. To give it further rigidity the use of Mellen's tripod stay is to be recommended; this handy device not only grips the legs and holds them firmly but prevents them from slipping or sliding on smooth and uneven floors. Once the convenience of a tripod stay is experienced, the telephotographer will never be without one.

A—View of clock tower, Houses of Parliament, from St. James' Park, London
Made with Beck-Steinheil Orthostigmat, 7⅛-inch focus

B—Same subject, from same viewpoint, with Beck-Steinheil Standard Power Tele-attachment fitted to the 7⅛-inch lens. Magnification, 8 diameters

Plates

Plates of extreme rapidity are not essential to the work, generally medium-rapidity plates or films will be found the easiest to work with. For preventing halation, which appears more or less in all photographs of every kind, backed or non-halation plates should be used.

Simple Calculations

With a little experience, the calculations necessary in using telephotographic lenses are easily worked out. Nothing of a mathematical nature is necessary, the figuring in each case being not more difficult than a rule-of-three sum. In this section we enumerate all the factors of the calculations, and affix examples of the manner in which they are applied to the working of the lens. The factors are

- f'. Focal length of the positive lens.
- f''. Focal length of the negative lens.
- a'. Aperture of the positive lens.
- a''. Aperture of the negative lens.
- s. Separation between the positive and negative lenses.
- b. Bellows extension for any particular magnification.
- m. Magnification of the image on the ground glass.
- d. Diagonal of the plate to be covered.
- t. Time of exposure.

1. What is the best focal length for the negative lens for use with any given positive? For moderate powers and cameras of short bellows the f'' should be about two-thirds that of f'. For example, with a positive lens of 7-inch focus and a bellows of 12-inch extension, the negative lens might well be of 5-inch focus. For higher powers and longer bellows the best f'' is about half that of the positive.

2. What is the necessary separation between the positive and negative lenses? This is variable. The minimum is equal to the difference of their focal lengths (f' minus f''). The maximum is equal to f'. Between these limits the separation depends upon the degree of magnification. The formula is —

$$s = f'' + \frac{f''}{m}.$$

3. What length of bellows is required to give a desired magnification? The answer is in the next formula—

$$b = f'' (m-1)$$

For example, to magnify four diameters with a negative lens of 3-inch focus, we get—

$$b = 3 (4-1) = 9\text{-inch length of bellows.}$$

4. What is the magnification possible with any given length of bellows? In this case the formula is—

$$m = \frac{b}{f''} + 1.$$

For example, with a negative lens of f″, equal to 3 inches, and a bellows extension of 12 inches, what enlargement can be secured?

$$m = \frac{12}{3} + 1 = 5 \text{ diameters.}$$

5. What size plate can be covered with any combination at any bellows extension?

$$d = \frac{b}{f''} \left\{ \frac{a' f'' + a'' f'}{f' - f''} \right\}$$

For example, with a positive lens of 7-inch focus and 1-inch aperture, and a negative lens of 3-inch focus and also 1-inch aperture, and a bellows length of 12 inches, what is the diagonal of the plate covered?

$$d = \frac{12}{3} \left\{ \frac{1 \times 3 + 1 \times 7}{7 - 3} \right\} = 4 \left\{ \frac{10}{4} \right\} = 10 \text{ inches.}$$

This is obviously ample allowance for a 5 x 7 plate.

6. What is the increase of exposure in any case? The rule is, ascertain the correct exposure in the case at hand for the positive used alone, multiply this figure by the square of the magnification; t = m times exposure for positive lens alone.

These formulæ are not so forbidding as they may look to the non-mathematical eye; they are merely so many simple ways of arriving at the data the telephotographer is sure to want in the course of his work, and they are inserted in this monograph because we think the reader will very often wish to consult them.

Practical Work

Getting to practical work, the first step the telephotographer must take is to provide a perfectly rigid stand for holding the camera and lens. He will make most of his exposures by time, with a small stop, so it is important that he should work from a firm base, not easily affected by tremor or vibration. Some photographers use a second stand for supporting the lens end of the outfit; others an arm which extends from the stand to the base of the camera; others a steel or brass rod which is secured to the top of the camera and the top of the lens, thus holding the entire arrangement firmly together. The camera must be strong and rigid, and firm both at the normal draw and its fullest extension. Parallel-bellows cameras are best for the work, as conical bellows sometimes cut off part of the image if the swing back is used on a vertical picture. The camera may often have to be tilted at an angle of 25° to 30° from the horizontal, so that there should be ample swing in the back. A tilting table is used by some workers for holding the camera, a ball and socket tripod top answers the same purpose and is simpler. Whatever means be adopted the end is the same, viz., when tilting the camera upward it should be held perfectly rigid and firm, or the outlines of the picture will be blurred.

Focusing

Let us suppose we are making an exposure on an outdoor subject: a house a mile off on a clear windless day. Set up the camera with the tripod legs widely separated, and attach the complete telephoto lens to the camera front. Rack out the camera fully and point it toward the house. Then with the positive lens at full aperture, using the rack and pinion on the mount, adjust the distance between the positive and negative until the house comes into focus. Bring the house into sharp focus in the center of the ground glass, placing the head under the focusing cloth in order to make the fine adjustment. A focusing magnifier is useful for the purpose, although a careful worker will not find it essential. After the focusing method has been mastered, variations in magnification and covering power of the lens with different camera extensions should be observed and noted. As the camera bellows is racked in and the image refocused,

the area of the picture will lessen and the corners of the screen become dark. Stop down the positive to *f* 11 or *f* 16 and watch the effect. The dark portions of the screen will decrease owing to the increase of covering power given to the lens by the smaller stop. A few trials will show at what particular extension the focusing screen is just covered, and the point marked on the base-board. At great distances and high magnifications much care is necessary in focusing. Three magnifications reduce the light passed by the positive lens alone to $\frac{1}{9}$; seven magnifications by $\frac{1}{49}$; ten magnifications to $\frac{1}{100}$. Light filters still further reduce it. In such circumstances the difficulty is possibly best overcome by throwing the image a little out of focus each way, and by means of the screw on the lens mount moving the negative lens a little each way, and striking a mean between the two extremes, with a little practice the photographer will get used to the work; some prominent or well-defined object in the view or subject will generally suggest itself as a focusing point on which to concentrate attention, and the adjustment will in time come easily and naturally.

Exposure

The rule for finding the exposure in telephotography is very simple. It is: multiply the exposure that would be given by the positive lens alone by the square of the magnification. For example, if with our 6-inch positive lens, the exposure, calculated by Wynne meter, or other means, is found to be 2 seconds, then with the 3-inch negative lens attached, giving a magnification of 5 times, the exposure would be $2 \times 25 = 50$ seconds. The rule is easily committed to memory. In calculating exposures, however, it is well to bear in mind that there are certain modifying factors, such as distance and intervening atmosphere, to be taken into account. Howard Farmer gives a table which shows the ratios of exposure at varying distances.

Distance of nearest shadow or nearest important object	Ratio of Exposure
10 ft. to 30 ft.	16
30 ft. to 100 ft.	8
100 ft. to 300 ft.	4
300 ft. to ¼ mile	2
Beyond ¼ mile	1

This, it is true, is only another way of emphasizing an old truth in photography; viz., the nearer the object the longer the exposure, the farther away it is, the shorter the exposure; Farmer, however, endeavors to reduce the rule to a matter of distance measurement, so as to give a definite guide in making the calculations. For near objects the calculation should always be made for the shadow parts of the picture (expose for the shadows and let the high lights take care of themselves). It is also advisable to bear the rule in mind for distant objects that may be of a dark color, that are surrounded by a large area of illumination; in such a case, there is risk of underexposure if the calculation be made for the lighter parts of the picture such as open water; or country, with no dark shadows. The intervention of atmosphere is also a factor that may influence the exposure very materially; a slight haze will reduce it. The matter will require some judgment on the part of the telephotographer. Generally, however, it may be said that long-distance photographs are only made successfully on clear, windless days. In normal circumstances the rule given is the best guide to follow, and if it is modified intelligently in accordance with Farmer's table it will answer well in practice. For figuring out the actual factors must of course be taken into account: these are subject, light value, lens aperture, and rapidity of plate. To work out the figures, a Wynne meter, or a similar instrument giving all the factors in convenient form, should be used; the influences of atmosphere, distance, and other causes must be weighed and considered by experience, when it has been gained by practical trial. One hint in respect of distant subjects is worth committing to memory. A brilliant light is not necessarily the best for the work: there may be scarcely visible haze in the air. If the distant shadows are very black, and sharply defined, it is a sign of clearness; grey shadows, on the other hand, indicate the presence of mist in the air. Some workers advocate reducing the theoretical exposures for distant subjects on account of the almost certain presence of mist in the air. This sort of thing is purely a matter of personal fancy upon which no reliance can be placed. In tele-

photography the exposures can be made by rule with the same success as in other branches of work.

Rapid Exposures

A word as to rapid exposures. The comparative slowness of an ordinary telephoto lens leads many to suppose that it can be used only for long exposures: and that rapid work cannot be done with it. This is an error. High-speed telephotography is in process of development. Marriage has photographed a train in motion at the rate of twenty miles an hour, the equivalent aperture of the telephoto lens being $f/12.6$, the exposure with a focal-plane shutter being $\frac{1}{80}$ of a second, time and date being four o'clock in April. The sun was in such a position that the train was in shadow. A stand-camera was used and the lens focused on the spot selected for the locomotive. This, it is true, is not very high-speed work, but it is sufficiently fast to show that the lens can be used for ordinary hand-camera photography. An aperture of $f/12.6$ means that a positive lens of $f/4$ approximately, was used, and that a magnification of three times was obtained. In this we are approaching the maximum of telephotographic rapidity—the lens, like all other lenses, having a limit of effective working aperture. For ordinary hand-camera work a low magnification, say three diameters, will be suitable on most subjects; with a positive of $f/4.5$ or $f/6$, exposure of $\frac{1}{100}$ of a second may be successfully attempted. This allows of the telephotography of moving figures—pedestrians, horses, vehicles; and, consequently, in the summer months, much outdoor work can be accomplished with the lens. Natural history subjects also admit of shutter exposures. A great future lies before the telephotographic lens for very rapid work; it is a field which has so far not been properly exploited. Its use with focal-plane shutters giving exposures as quickly as $\frac{1}{1500}$ of a second, is possible; and so, in the photographing of objects moving at great velocity, the camera could be worked at a greater distance from the object than at present. But this application of telephotography remains for future development.

The Telephoto Hood

The delicate focusing of a telephotographic image is facilitated by the exclusion of all light from the focusing screen

except that which passes through the lens to form the image. Captain Wheeler has devised a hood which helps this object. It consists of a square bellows fitted to two aluminum frames, which slide along an aluminum tube and clamp in any position. The back tube screws into the front of the positive lens and the bellows extends to such a position that all light is cut off entering the lens except that which goes to make the photograph. The hood also shields the plate from diffused and reflected light in the camera which degrades the image and impairs the quality of definition, especially in prolonged exposures. The hood therefore increases the brilliancy of the negative, as positive lenses admit a large angle of light, much of which is not necessary to form an image. The Beck-Wheeler Telephoto hood, as the piece of apparatus is called, is sold by R. and J. Beck, London.

Centering the Lens

As we have pointed out the telephoto lens gives a narrow angle of view; consequently it allows of little or no horizontal or vertical displacement. The lens should always be kept opposite the center of the plate and in photographing a lofty object the camera should be tilted until the object is properly placed on the screen, when the back should be swung to the perpendicular. By raising or lowering the lens a part of the picture may be cut off. Swinging the back to a great extent necessitates the lens being stopped down. The choice of a stop is governed by the depth of field wanted in the photograph, or the exposure that can be given. A large stop is best for figures and landscapes. A portrait lens at full aperture can be used for the positive if the principal object is sharply focused. For architectural detail a small stop such as *f* 16 or *f* 22 is to be preferred. The exposure can be prolonged at will and the finer details of the objects brought out.

Architecture

For architectural subjects and remote details in tall buildings, the photographing of which is difficult with the ordinary lens, the telephoto finds one of its most useful applications. A 6-inch rectilinear or anastigmat and a 3-inch negative is a convenient equipment for a 5 x 7 camera. The plate is well covered at an extension of nine to ten

inches. Rigidity of camera and stand are essential in this work. If the detail of the building to be photographed is high up, place the camera as far as possible away from it to avoid foreshortening. In order that the lens shall sharply cover the plate, it is sometimes necessary to go farther away from a comparatively accessible object, because the longer the draw the larger the size of plate covered, and an increase of distance between camera and object means the use of a longer extension to keep the image on the screen the same size as before. Before exposing on an architectural subject, see that the camera back is parallel with the principal plane of the object, or the lines will be distorted in the photograph. Another hint: use a spirit-level for ascertaining if the camera is properly leveled. The most successful telephotographs of architectural subjects are taken in diffused light; if the sun is shining, shield the lens from it. In the photography of interiors it is well to guard against prolonged exposure, on high lights that border on dark shadows, for then halation of the negative is more likely to result. The absence of light will increase the difficulty of focusing, especially if the lens is pointed toward the shadows. Large printed matter, temporarily lighted by gas, lamp or candle, will assist the worker in getting a sharp image on the screen. For interior exposures, the use of a meter in making the calculations is imperative; reliance upon the fallible factor judgment is not at all to be advocated. If the exposure can be prolonged it is as well to use a small stop in the positive, so as to increase the defining power and depth of focus of the lens, but a smaller aperture than $f/70$ must not be used, otherwise diffraction, i. e., blurring of outline will result in the negative.

Landscape

The principal difficulties to contend with in landscape work, and open view subjects, whether on land or sea, are haze; vibration of the camera through wind; and movement of the heated atmosphere which is not obviously hazy, a visually clear atmosphere not always being actually so. Haze in the atmosphere will produce fog in the negative. A color-sensitive plate, used with a suitable light filter is best for distant landscapes taken

under these conditions. To shield the camera from the wind choose the shelter of a wall or house. An umbrella held against the wind and close to, but not touching the camera, will be found useful. To avoid atmospheric vibrations early morning is best for telephotographic exposures, but in clear cold weather successful results can be got throughout the day. For very distant objects as high a magnification as 10 to 15 may be attempted, but in the greater number of ordinary outdoor subjects, those which in photography are known as open views, 5 magnifications will be found quite large enough.

Pictorial Work with the Telephoto

The practical advantages of the telephoto lens to the pictorial and view photographer will be obvious to any one who will consider it as simply a battery of lenses of variable focal lengths, putting aside its other uses for the moment. With size or scale of image and and angle of view (or amount of subject) included on the plate dependent on the focal length of the lens used, the possession of a telephoto combination gives practically complete control over these important factors in the composition or rendering of the subject, enabling the worker to exercise his selective capabilities to the utmost, foregrounds, amount of sky space, scale of object of principal interest and emphasis of any desired feature all falling within his enlarged lens capacity. An example of the range of power thus put into the hands of the photographer may be seen in the four accompanying views of a Jersey farm, by A. R. Dugmore, republished by the courtesy of the Goerz American Optical Company.

High Magnifications

According to Captain Wheeler, the limit of high power magnification in telephotographic work can be very considerably extended beyond the point usually reached. With the Staley-Wheeler lens, placed on the market by Staley & Co., London, Wheeler claims to get nearly 60 magnifications with a camera extension of about 16½ inches. This he does by using a negative lens of extremely short focus; a half-inch negative on a camera extension of about 14 inches extension giving 29 magnifications. The essence of the idea is the addition to the

A New Jersey Farm

By A. R. Dugmore

A—Taken with Goerz Dagor No. 2 (F.6.8). Focus, 7 inches

By A. R. Dugmore

B—Same subject, taken from same position as No. 1, with Goerz Dagor No. [illegible], and Goerz Telephoto lens. Stop, F. [illegible]. Exposure, 1½ seconds. Magnification, 4 diameters.

By A. R. Dugmore

C—Same subject, taken from same position as Nos. 1 and 2, with Goerz Dagor No. 2, and Goerz Telephoto lens. Stop, F.32. Exposure, 2 seconds. Magnification, 6 diameters.

By A. R. Dugmore

D—Same subject, taken from same position as Nos. 1, 2 and 3, with Goerz Dagor No. [illegible] and Goerz Telephoto Lens. Stop, F.32
Exposure, 5 seconds. Magnification, 8 diameters.

positive lens of a convertible negative combination of varying foci. Any of the lenses of the combination can be used singly; the standard set gives degrees of magnification up to about 30 diameters. Assuming the positive lens to be 7 inches focus the equivalent foci obtained with the Staley-Wheeler negative attachment ranges from 7 inches to about 18 feet! Wheeler states that he can focus sharply with a combination giving nearly 60 magnifications, the positive lens working at *f*/8. He states that at only 30 magnifications, with *f*/5.6, or *f*/4.5 positive lenses there is plenty of light in all ordinary cases. The Staley-Wheeler Telephoto appears to give remarkable results; but further experience with it is necessary before its claims can be finally passed.

Telephotographic Definition

A comparison of the definition of a telephotograph with that obtained with a good positive lens when used alone may and sometimes does show that the quality of the former is not so fine as the latter. The real test of the point is how far the telephotograph will stand subsequent enlargement. Telephotographs at nine magnifications have been produced which stood further enlargement by four diameters, without stopping the positive lens to a smaller opening than *f*/11 or *f*/16. The definition of the negative is good all over and, according to Captain Wheeler, a 5 x 7 will enlarge satisfactorily to about 19 x 26 inches. At very high magnifications the definition necessarily falls off, but even then it should be of a good quality; pictures of such a size are not viewed from so near a point as photographs taken with lenses of shorter foci, and consequently one does not look for the same quality of microscopic definition in them as in smaller prints.

Near Objects

The telephoto lens, as already pointed out, has the useful property of rendering near objects with a pleasing effect of drawing. In the case of flower studies, for example, the parts of the object lying in various planes are shown free from exaggerated differences in size, and isolation of the principal object against a simple background is more easily obtained. H. T. Malby gets an image of the same size as the original with a distance of seventy-

two inches between object and lens; to effect this it is necessary that the camera extension should be twice the equivalent focus of the telephoto lens, in accordance with the well-known rule applicable to the copying of objects same size. To give some idea of the value of the lens for photographing near objects let us suppose it necessary to take a flower an appreciable size on a 5 x 7 plate; we should have to get within three feet of the object; put a negative attachment on the positive lens which will give eight magnifications and the same-sized picture can be gotten with the camera twenty-four feet away. From what has been said it will be evident that the telephoto lens can be used for copying purposes where exposure is of secondary consideration.

Portraiture

A common defect seen in portraits taken with lenses of too short focal length is distortion of the features, hands and feet; the telephoto lens by virtually lengthening the distance between the objective and the focal plane gives a more natural drawing by preventing this exaggeration of rendering. The lens therefore finds a valuable field in studio portraiture, especially if the work has to be done in confined situations, or short studios. W. Cadby has experimented with the Adon telephoto lens for portraiture. Using the lens on a studio camera and in a room measuring 15 x 14 feet, he exposed the lens with full aperture and produced softly defined pictures at close quarters without distortion. He compares them with pictures obtained with the Dallmeyer-Bergheim lens, a lens which gives soft images without loss of structure. Robert Demachy made comparative results with a rectilinear lens and a telephoto, the subject being a lady standing in a garden on a gravelled path in front of a country house. The effect in the first photograph as if one looks down on the figure, the line of the gravel path being as high as the shoulder, a plot of grass looking "like an ugly slice of a big cake." In the telephotograph the gravelled path comes up only to some distance below the waist, one is looking up at the figure instead of down on it, the grass plot flattens out, and, although the house in the background appears much nearer to the figure than before, there is an illusion of

atmosphere which is wanting in the other photograph, with a softness and other subtle differences not to be found in it. The Dallmeyer-Bergheim lens, which by some workers is classified as a telephotographic lens, is a combination of single uncorrected positive and negative elements separated by a mount, with the aperture placed in front of the positive. Marriage has published some experimental results with it. The lens being uncorrected, the image seen by the eye on the screen is not what the plate records; upon racking the lens in and out, colored fringes are seen where the lights and shadows oppose. The definition appears sharpest to the eye when there is a blue halo round the high lights: In order to make a sharp impression on the sensitive plate, the lens should be altered until there is an appearance of red at those points. The sitter being about twelve feet from the lens and the camera racked out to its fullest extent, the distance between the negative lens and the screen was thirty inches. The exposure with a No. 2 lens on a rapid plate at full aperture—equivalent to *f*/16—was six seconds, and in the picture the detail was softly rendered and the distortion of the features and limbs of standing figures was suppressed. All this bears out what has been said of the telephoto lens as one which renders portraits in pleasing perspective. The hands, head, body and feet are shown to the eye in their proper proportions in the photograph, whilst the surrounding objects, if there be any, are subordinated in size to the central object of interest. In group, figure and portrait work it is unfortunately mostly the other way, as the reader can see for himself by taking up and examining the next commercially produced—or amateur—portraits that come his way.

Reflex Camera Work

In hand-camera telephotography some difficulty may be found in focusing the principal object; at moderate magnification it can be centered correctly on the plate by the use of an ordinary finder, but accurate focusing by scale if the object is near is out of the question. A reflex camera is essential for such delicate focusing as a telephoto lens necessitates. If the object advances towards or recedes from the lens, it is a good plan to anticipate a

little with the focusing and make the exposure when the position of maximum sharpness on the ground glass of the reflector is reached. Focus by altering the separation of the lenses; the milled head screw on the negative end of the tube should be large enough to allow of slow and steady movement of the rack and pinion. When using a reflex camera for this work C. S. Akerman finds that underexposure is a great danger. He uses a focal-plane shutter; a 5¼-inch positive lens with a working aperture of *f*/3 and a 2¼-inch negative, the equivalent aperture of the combination being *f*/15. He frequently works at *f*/24 with equivalent focal lengths varying 27 to 40 inches. In exposing he finds that the jerk given by the release of the mirror is no drawback; he makes a point of holding the camera more steadily than a hand-camera with an ordinary lens, and recommends an additional stay for the lens if the camera is used at long extension. When working, the camera should be slung from the shoulder in order to leave the hands free; adjustment of the focus is exceedingly difficult if the camera is held in the hand in the ordinary way of outdoor photography.

Stereo-telephotography

A modification of the telephot, as already described, can be used for making stereoscopic telephotographs, i. e., double photographs of distant objects which, when properly cut and mounted, show in a stereoscope the illusions of relief and solidity. Two lenses mounted on the camera front, separated by a distance of eleven and one-half inches and having focal lengths of twenty-seven and one-half inches, pass images of distant objects to inclined-plane mirrors situated at the back of the camera. These plane mirrors transmit the images to other inclined-plane mirrors situated in the same plane as the positive lenses, the images being finally reflected on to the focal plane at the back of the camera, which is virtually a double camera, one instrument being superposed on another. An alternative plan is the employment of a pair of telephoto lenses in a binocular camera. The work is difficult and only to be attempted by advanced practitioners interested in the stereoscopic rendering of remotely situated objects.

Development In developing telephotographs of near objects the plan in ordinary use should be followed; good, clear negatives may, in normal circumstances, be looked for. In negatives of distant objects a certain amount of fog will usually be seen, due to the presence of haze in the atmosphere, a condition that prevails in the greater number of cases. Orthochromatic plates and a suitable light filter will cut out the haze in distant landscapes. On clear days slow, ordinary plates also give good results. Sometimes when a telephotographic negative is developing the image will be veiled and the photographer may be inclined to reject the plate as spoilt; this should not be done, as the veil or fog is simply the characteristic haze of the subject coming out under the influence of the developing solution. Let development be proceeded with and a good negative will be obtained.

Printing High-surface papers are the most suitable for printing telephotographs, as the definition of the negative is not reduced, which would be the case if some of the rough-surface "pictorial" papers, now so much in favor, were used. Though telephotographs may be treated from the pictorial aspect, it is nevertheless true that their main value lies in their qualities of definition and the correct rendering of the delicate tones of the original subject, so that the worker is recommended to apply the recognized rules of "straight" negative-making and printing to their reproduction. In our experience telephotographs make excellent subjects for lantern slides and always deeply interest an audience in showing the remarkable results that can be made with the lens. We remember with pleasure the great effect produced upon our hearers when showing on the screen, in the course of a lecture, a lantern slide of Boissonnas' wonderful telephotograph of Mont Blanc, taken from a distance of forty-five miles. In more recent years the interesting telephotographs exhibited by Dr. Elmendorf and other professional lecturers have excited public admiration and comment. As a natural result of this publicity, progressive photographers here and abroad are turning to telephotography and its possibilities with new interest and enthusiasm.

As a comparatively unworked field it has many fascinations for the careful worker in photography. Those who enter upon it with an intelligent grasp of what we have set forth in these pages should quickly reach successful results with little or no difficulty.

BOOKS

Telephoto Work. By C. H. Deller. 1904. 63 pp.

Elementary Telephotography. By E. Marriage. 1901 118 pp. Illustrated: with tables.

Telephotography. By T. R. Dallmeyer. 1899. 148 pp.

Apart from these works, of which that by Marriage is perhaps the most helpful, the reader will find much useful information in the telephoto booklets issued by the different lens makers here and abroad, a list of which we give here for the information of those interested: Dr. Rudolph's monograph on *Telephotographic Objectives*, and the Zeiss catalogues from E. B. Meyrowitz, New York; the *Adon and Adon Junior* booklets (Dallmeyer, Ltd.) from Burke & James, Chicago; *Practical Notes on Telephotography*, from R. & J. Beck, London; *The Bis-Telar*, from Busch Optical Company, London; *The Ross Telephoto Tubes*, from George Murphy, Inc., New York, and the catalogues of the Goerz American Optical Company, New York; the Voigtländer & Sohn Optical Works, New York; the Bausch & Lomb Optical Co., Rochester; Gundlach-Manhattan Optical Company, Rochester, and *The Steinheil Tele-Objectives*, from Herbert & Huesgen, New York.

Notes and Comment

The July number of THE PHOTO-MINIATURE, to be published as near July eighteenth as possible, will be devoted to the timely and interesting subject: "Photographing Outdoor Sports." The monograph is rich in practical details and working methods, covering all the popular outdoor games and sports and will, we are sure, be welcomed by our readers as filling the proverbial "long-felt want."

The Reaper, "Whose name is Death," has been unusually active in photographic fields of late, and we record, with a deep sense of personal loss, the passing of three well-known workers:

Henry Lomb, one of the founders of the Bausch & Lomb Optical Co., who died at his home in Rochester, N. Y., June 13, in his eightieth year. Captain Lomb's long life was filled with good deeds and public benefactions and he was deservedly beloved by his fellow citizens in all walks of life.

Thomas Winfield Pattison, general manager of the American Aristotype Company, who died in New York City, June 21, in his fifty-fourth year. Mr. Pattison was a conspicuous figure at the national and state conventions of the past twenty-five years, and, by his genial personality and indefatigable loyalty to his business interests was probably more widely known and loved than any other man in the photographic fraternity.

J. B. Pelgrift, for many years the traveling representative of the Scovill & Adams Co., who died at his home in Brooklyn, N. Y., June 15. Mr. Pelgrift was identified with the photographic trade for over forty years and made a friend of every man he met in all the years: a modest, single-hearted gentleman, the embodiment of loyalty and integrity in word and deed.

The innumerable friends of Mr. and Mrs. H. Snowden Ward, of London, will hear with pleasure of their intention to revisit this country during the latter part of the year. Mrs. Ward has almost completely recovered from the effects of an accident of some months ago and is again taking up her photographic and literary work with her old-time enthusiasm.

Few photographic specialties introduced of late years have awakened so much interest and comment as the Multi Speed shutter put out by the Multi Speed Shutter Company, 324 East 65th street, New York. However incredible the claims made for this shutter may seem at first glance, the remarkable pictures and testimonials given in the new booklet, just issued, fully bear out the assertions of the makers of the shutter as to its actual efficiency. Every one interested in high-speed photography should see this booklet, which can be had for the asking.

A few days ago we had the big pleasure of a visit from Mr. Nelson C. Hawks, of Alameda, California,—a delightful little city just across the bay from San Francisco. Although largely busied with public life and the civic interests of Alameda, Mr. Hawks still finds time to make up the famous "Heavenly Twins" developer for the discerning few who cannot be persuaded to use any other developer, and still the flying hours find him busy perfecting "Polychrome," which is to displace platinotype paper.

A tip from experience. If the reader would like to possess an enlargement worthy of the name from one of his favorite negatives, let him straightway be persuaded to send the negative (with a dollar bill) to Ernest F. Keller, 108 Fulton Street, New York, and within a few days he will receive an 11 x 14 print on Royal Sepia Bromide which will cause him to reverence the name of Keller forevermore.

Every worker in photography knows the difficulty of acquiring the useful knack of counting seconds correctly, and innumerable attempts have been made to solve the problem. The AGFA Time Counting Table does the trick at a glance, automatically, accurately, and without reference to clock, timepiece or other device. Once seen the method can be memorized by a ten-year-old in two minutes, after which it cannot be forgotten. Send a two-cent stamp to F. Harry Hall, Berlin Aniline Works, 213 Water Street, New York, mentioning THE PHOTO-MINIATURE, and the method is yours.

An attractive line of cameras and optical specialties, new to the American market, is fully described in the illustrated catalogue just issued by the Voigtlander & Sohn A. G. Optical Works, 225 Fifth Avenue, New York. The novelties include the Voigtlander Reflex, the Metal Folding, and the Alpine cameras, embodying many new and desirable features which must be seen to be fully appreciated. Copies of the catalogue can be had on request.

J. L. Lewis, 379 Sixth Avenue, New York, whose well-known Leto Seltona papers have reached immense popularity of late, sends us a pocket-list of all the Leto and Barnet Papers, plates and rollfilms for which he has the U. S. agency. Readers who are as yet unacquainted with the merits of the goods should write for the list and widen their knowledge of the good things of life.

A useful and much-needed convenience comes to our worktable from Geo. Murphy Inc., New York, in the form of a handy thermometer for use with developing tanks, etc. The Eagle Thermometer is graded in degrees Fahr. with a red mark at the normal developer temperature of 65°, and sells at 55 cents: three good points which all who use tank development will quickly appreciate.

Congratulations and all good wishes to Mr. Charles H. Plump, editor of our contemporary *The Photographic Times*, who has taken unto himself a wife and a farm. May the joys of the one make up for the cares of the other for many a happy year to come.

Pressure upon our space prevents more than a bare mention of the new catalogues of the Defender Photo Supply Company, Rochester, N. Y.; the Crown Optical Company, Rochester, N. Y.; a new shutter introduced by the Wollensak Optical Company, Rochester, N. Y., and a cleverly written and profusely illustrated booklet with the title *Graflex Results*, just received from the Folmer & Schwing Division, Eastman Kodak Company, Rochester, N. Y. These will be noticed in our next issue, but readers will do well to send for copies for themselves and keep up with the progress of the world.

The American agency for the famous Steinheil lenses has been transferred to Herbert & Huesgen, 311 Madison avenue, New York, who, by their entended experience as lens experts, are well qualified to place these splendid instruments properly before American workers.

Baseball: Caught between second and third bases.

Edwin Levick

Baseball; A critical decision. Umpire watching whether runner will reach the home plate before ball is returned to catcher.

Edwin Levick

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AND THOMAS BEDDING, F. R. P. S.
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Photographing Outdoor Sports

As an accurate recorder of life as it is lived, the camera finds a fertile field in the sports of a people. A love of sport manifests itself somehow in every race of mankind. The inarticulate infant, first of all, plays with a ball; then with *felis domesticus*, otherwise the common cat; next with the paternal gun; and finally grows up to discover that, being a fine day, he must go out and shoot something. This grotesque Gallic conception of Anglo-American sportsmanship exaggerates the depth of a common instinct, but hovers close to the truth of it. The soaring human boy is nothing if not a sportsman by conviction, and, if he does not shoot something, he, in most cases, pits himself against his fellow boy in the modern substitutes for the Isthmian games. So in course of time he aspires to baseball fame; rises from "the level mead where they drave the wickets in" to cricket celebrity; wins a golf championship, or the fleeting honor of a hundred-yard world's record; becomes the owner of a trotting queen or a Derby winner. It's all sport, and it is bred in the bone. Waterloo was said by Wellington to have been won on the playing fields of Eton—historians are not agreed as to the absolute authenticity of this remark, but no matter; a new race of sportsmen is being reared in the nursery at this very moment, and so are those who will photograph them

when they come before the public eye. And they are the objects of our solicitude.

The sportsman today is usually a photographer of some sort, good or bad; indeed, a knowledge of sport or photography or both, in these times, is part of a liberal education. Pedantry and pedagogy have not averted the growth of a great love for the out-door life. Good health is much an affair of living in the open air, and man is gradually reverting to the primitive state of things. And as he and she like to have their out-of-door doings photographed and to see them in print, newspaper and magazine editors find their choicest subjects in photographs of sporting events. For out-door life and sport are commonly one and the same sort of thing. Now, a successful photographer of out-door sports is a product of the higher education in photography and sport. As we have already hinted, he is invariably a trained or practical sportsman, competent to follow and analyse the points of the game he is photographing, and thoroughly master of his camera and its fitments. Unless some such blend of qualities is found in our photographer of out-door sports, success at the work is hazardous. Eye, hand and brain must act swiftly and in perfect unison when the work is on, and, if they do, the development of the resulting picture offers no more fascinating sensation of pleasure and satisfaction.

The List

The number of outdoor sports indulged in by modern athletes is considerable; they vary of course with each country and climate, so that a complete enumeration of them would run into a list possibly too great for photographic treatment in these pages. If, however, we list the principal sports in vogue among English speaking people, we shall probably satisfy every reasonable requirement of our readers and mark out a tolerably wide field for our excursion. They are as follows: Baseball, cricket, golf, cycling, football, lawn tennis, rowing, angling, horse sports, swimming, diving, water-polo, hockey, lacrosse, hunting, ice sports—ski-ing, tobogganing, skating, canoeing, sailing, coursing, running, leaping, jumping, walking, badminton, croquet, bowling, military camp sports, quoits, shooting—in all about

thirty distinct varieties. Many minor sports and pastimes are excluded from this list—open air wrestling, curling, shinty and others of a purely local or national character. They do not necessitate great velocity of movement on the part of the player, or the implements he uses, and offer comparatively little difficulty.

The Key to Success

Success in photographing outdoor sports, then, depends upon the same conditions as success in the sports themselves. It is all a matter of temperament, nerve, training, and physical condition. The best work of the kind is done either by sportsmen, or by those who have laid themselves down to study a particular form, or forms, of sport, from all ends of it, and then have applied all their photographic knowledge to the making of good negatives of the subjects. We have in mind the case of a lethargic friend who, a few years ago, was connected with the photographic business and suddenly found himself confronted by the need of making an outdoor living at photography. By sheer nerve and persistency, he, who at one time seemed the least likely person in the world to do such a thing, made himself such a master of race-track, hunting, and outdoor sporting photography generally that he has won international reputation for the quality of his work. This case is typical of many. On the other hand, examples in great number could be given of the successful sportsman or athlete turning photographer of the sport in which he once excelled. We shall quote some of these cases in the course of this monograph.

High Speed Work

Now, if the reader will glance carefully at the list already given, one fact of many will be evident to him, viz., that it involves the photography of rapidly-moving men, objects or animals. Take the case of golf. It has been calculated that when the ball is struck—or driven—from the tee it travels with the velocity of 300 feet a second, supposing a player of first-class ability to be handling the driver. In football, baseball, cricket, running, a man moves approximately at the rate of 10 feet a second ; a cricket or tennis ball when well struck probably travels at rather less than the speed of a golf

ball ; a college eight at top speed moves, probably, at the rate of 22 feet per second ; a thoroughbred race horse at from 44 to 70 feet per second ; a trotting horse at over 44 feet per second. These figures are approximate, but they are near enough to bring home the fact to the would-be photographer of outdoor sports that he is dealing with very rapid camera work. As a matter of fact, his exposure will frequently require to be as short as $\frac{1}{1200}$ of a second : a circumstance which decides the qualities and nature of the camera, lens and sensitive surfaces with which he must work. They must all make for the greatest rapidity of exposure, when it is necessary to give it : so that the photographer of outdoor sports is clearly, or should be, a cut above the mere snap-shotter. He belongs to a class that is rapidly growing in photography, that of the serious worker.

Apparatus

From this it is plain that the prime essentials for success in work of the sort under consideration are (1): An exposure shutter which will give exposures sufficiently short to arrest the action or movement in the subject, and (2): A lens capable of admitting sufficient light during the exposure period to yield a developable negative. Obviously, the sensitive plate or film used must be of the extra-rapid class, so that normal development will give a negative of fair printing density with a reasonable amount of detail and gradation throughout the image.

Camera and Shutter

These points decided and speed being recognized as the governing necessity, the choice of camera, lens and shutter may be left to the preferences of the individual worker. The form of camera will be largely influenced by the type of shutter preferred. With most expert sports photographers the focal plane shutter is in high favor, because of its wide range of high-speed exposures and great light efficiency. Among cameras fitted with focal plane shutters, we have the reflecting mirror type, such as the Graflex, Reflex and Voigtlander Reflex in America, and the Soho, Argus, Videx and a dozen others in Great Britain. The advantage peculiar to this type is that one has a full-size image of the subject plainly in

view up to the movement of exposure, which obviates many uncertainties and difficulties and simplifies the obtaining of successful results. Another form is that usually described as the direct-vision type, such as the Goerz-Anschutz, Zeiss Palmos, and Voigtlander cameras which have a collapsible leather body and are exceedingly compact. The finder, as indicated, is fixed vertically above the focal plane shutter, so that the photographer looks through it at his subject. More recently we have the well-known Kodak fitted with a focal plane shutter, thus combining all the practical advantages of the focal plane shutter with the extreme compactness and convenience of the Kodak.

Latterly the supremacy of the focal plane shutter for high speed work has been seriously challenged by the introduction of a new form of between-lens shutter, the multispeed shutter, for which a range of exposures up to and beyond $\frac{1}{2000}$ of a second is claimed, the shutter blades being of novel design and admitting a greater volume of light than other shutters of this class. This shutter is strongly endorsed by many experienced workers and permits the use of any desired form of camera.

Lenses

The choice of a lens for sport photography need not detain us more than a moment. Short exposures, often under difficult conditions of subject, light, weather, etc., being imperative, and a well defined image being important, the lens should be an anastigmat capable of working at $f/6.8$ or larger if possible. To enumerate these would mean practically a list of all modern anastigmats, which is unnecessary. A good rectilinear lens will give satisfactory results only when all the conditions are most favorable, and cannot be considered for a moment where all-around work is concerned.

Plates and Films

Despite the fact that plates of the utmost rapidity obtainable are invariably advised for photographing outdoor sports, in practice the most expert workers use plates of less than ultra-rapid speed whenever this course is possible. Ultra-rapid plates are difficult to handle, are liable to be coarse in grain and fog, even with the most careful manipulation. Looking over some hundreds of

high-speed exposures, we find the following brands most frequently mentioned: Seed Gilt Edge 27; Seed 26x; Cramer Crown; Hammer; Lumière Sigma; Eastman film; Imperial S. S.; Barnet Red Seal; Barnet and Ensign films; Ansco film; Imperial Flashlight and Premo Filmpack. The curious fact here is that, although no roll film at present available will approach the most rapid brands of plates in a test of actual speed, yet in practice it is clearly proven that roll film is equal to every possible requirement in speed photography and gives results in every way equal to the best produced on plates. With this knowledge, the reader can safely make his choice according to his individual preference, without any necessity of abandoning the use of films, if these are most convenient for his purpose.

Summarizing what has already been written, we have seen (1) what are the conditions of success in photographing outdoor sports; (2) the approximate velocities of the men and other animals who take part in those sports; (3) the necessity of rapid shutters, lenses and plates for recording arrested motion; (4) and the best types of apparatus for the work. We now come to the several subdivisions of the work, and will deal with the various forms of sport in the order of their popularity. First of all a word as to the calculation of exposures.

Size of Image and Exposure

It is a fixed law in photography that the size of the image is entirely decided by the focal length of the lens that is used. In the photography of out-door sports, we are almost exclusively dealing with men and horses, and the size of them in the photograph is of importance. A rough guide to a knowledge of how large they will appear in the negative is as follows: If with a 5-inch lens the figure of a man or horse at 20 feet distance is 1 1/2 inches in size, then with a 6-inch lens, to get a figure of the same size, we must work at a distance of 25 feet; with a 7-inch lens, at 30 feet. With a given lens, doubling the distance halves the size of the image; halving the distance doubles the size of the image. To photograph the figures 1 1/2 inches in size, and in motion, under the following conditions, the exposures should be:

	At right angles to camera	At angle of 45°	Moving toward camera
Fast runner	$\frac{1}{655}$	$\frac{1}{490}$	$\frac{1}{270}$
Fast skater	$\frac{1}{1000}$	$\frac{1}{655}$	$\frac{1}{330}$
Fast walker	$\frac{1}{160}$	$\frac{1}{105}$	$\frac{1}{50}$
Cycle racing	$\frac{1}{655}$	$\frac{1}{490}$	$\frac{1}{215}$
Trotting horse	$\frac{1}{1000}$	$\frac{1}{655}$	$\frac{1}{330}$
Galloping horse	$\frac{1}{1200}$	$\frac{1}{825}$	$\frac{1}{490}$

Modifying Factors

That these figures are liable to modification when exposures are calculated for any given subject and set of conditions, may be seen from a review of the following factors governing the photographing of moving objects out-of-doors, viz: light value, lens stop, speed of plate or film, distance of object, speed and direction of movement. But they represent the means of many experiments made under varying circumstances. An exposure meter, such as the Autotime or Watkins, or any handy exposure table, will enable the photographer to co-relate the different factors and figure out the modifications demanded by the case in question. Speaking generally, however, in this class of work, where the speed of movement in the subject is known, very little experience will provide a fairly safe guide in practice, and calculations can be left for drill work and the leisure hour. A comprehensive summary of exposure factors in speed work is given in THE PHOTO-MINIATURE, No. 77, on "Focal Plane Photography," which should prove of inestimable value to all who seek success in photographing out-door sports.

Baseball

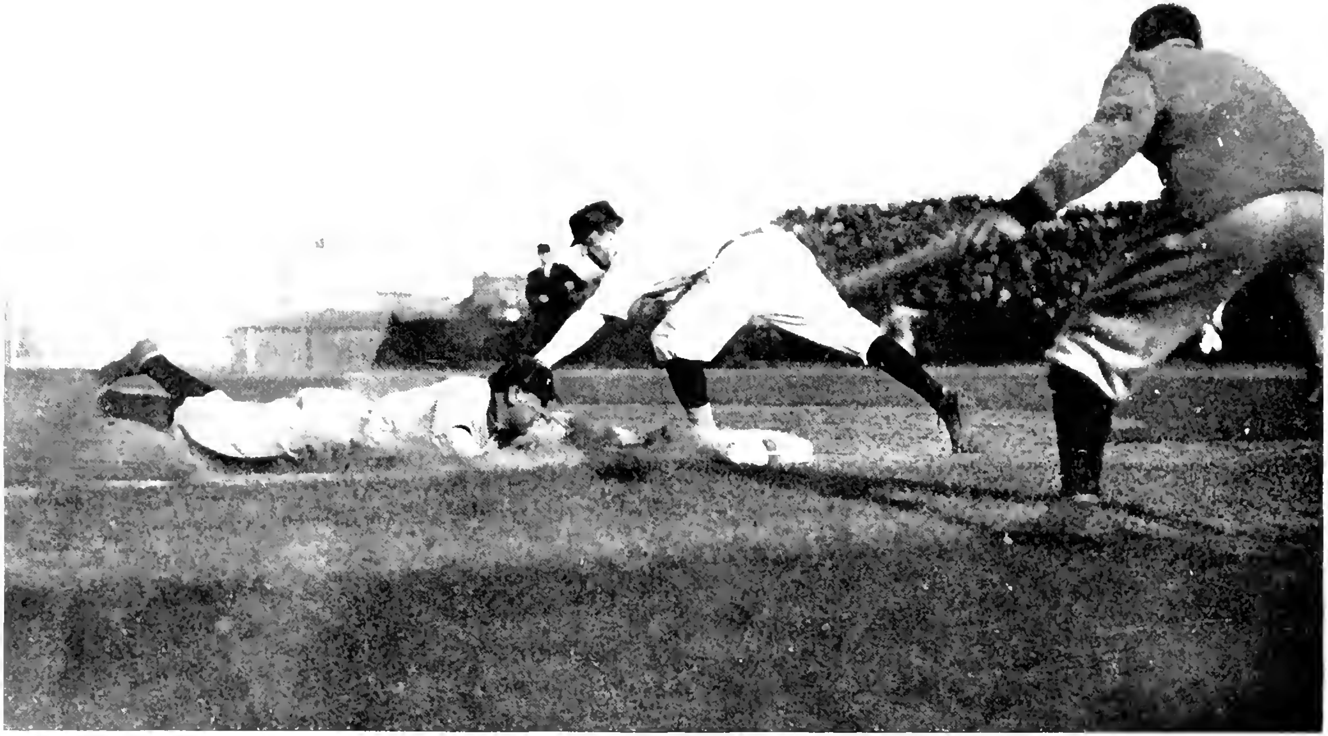
In taking up the different sports, first place is naturally given to the national game, baseball. Here, as in all that follows, a practical knowledge of the points of the game will add to the interest of the work and the results secured. Among the pictorial features of the game usually chosen for illustration, we have the procession of the teams up the field at the start, then the men at their positions, the pitcher, catcher, the man at the bat, and so on. These have their characteristic poses and man-

nerisms, and require individual attention. In action, it will be noted that the pitcher holds himself at rest just before delivering the ball, twisting or gathering his fingers around the ball in his own peculiar way. Similarly,

Baseball: Sliding back to first base

Edwin Levick

the catcher behind the batsman has his characteristic pose. Running to bases offers many opportunities for interesting records, especially when a man "slides to base" at a close touch. Now and again, as the accompanying illustrations show, very interesting groups are



Baseball: Sliding to third base and "out."

Edwin Levick

available as subjects when catcher, runner and umpire all come within the field of view.

The velocity of movement in ball delivery is such that exposures of $\frac{1}{1000}$ second or less are required to show a clean-cut image of the ball in the air. It should preferably be photographed from a view point where it is seen traveling towards or from the camera. A rare chance is given, now and again, when a catcher leaps vertically in the air to stop the ball. Players running for bases travel at about the same speed as in a hundred yards' dash; at and around the bases the movement is less speedy, as a rule, the exposures ranging from $\frac{1}{500}$ to $\frac{1}{300}$ of a second in a good light.

If the results obtained at first seem far removed from the splendid illustrations given in public prints, let the reader remind himself that many, if not a majority of these are posed for on the field before or after the game, or at practice, rather than made during the game itself. Almost any player will take his characteristic pose on reasonable request, putting into it all the fire and zest of actual play.

Football

This, the chief outdoor winter game, commences in the month of September, and continues in full swing until the end of April. It ranks next to golf in popularity amongst Anglo-Saxon sportsmen, and offers the photographer a fine field for high speed work. The interest in the game fluctuates every minute, whether Soccer ("Association" it is more academically called), or Rugby, be the form of it that is played. The underlying principle of both is the same: the ball has either to be manually shot, or kicked by the foot, between the goal-posts of the opposing side. Critical play, therefore, chiefly centers around the goals; but the play up the field is always the fastest. There the scrummages, melées and fast runs take place; there the passing, dribbling and tactical shooting occur, and opportunities arise for making effective pictures of football groups.

The power of the light falls off from September to December and increases in value from January to April: but, except in very dark or foggy weather, this need not cause the photographer any vital trouble, as football

does not call for the very highest speed work, $\frac{1}{800}$ being probably the fastest rate at which the shutter need work; most of the exposures being slower than this, really fast runs up the field being of infrequent occurrence. The photographer should take up a position—if he can get it—about 75 feet from the goal-posts with the sun at his back, the lens being focused for an object about 60 feet off. It must be noted that play does not take place until well on in the afternoon when the light is diminishing in power, so that allowance must be made for this. Around the goal the most exciting play

Made with a Graflex

takes place, and there the greater number of players are gathered together at one time, so that the opportunities of exposing on characteristic groups are many.

The photographer must rely upon chance for those opportunities,—the game changes so rapidly. It is a good plan to have the camera always focused and to release the shutter whenever a group of players come into the range. Football is essentially a plate-using sport—so the photographer must make up his mind to be generous with his exposures. In the Rugby game, the "line out" should never be missed: a subject like this will require an exposure of about $\frac{1}{600}$ of a second with the lens at *f*/6; passing; handing off; intercepting a pass; the "scrum," are lively group subjects which can be dealt with at about $\frac{1}{500}$ of a second.

In Association football successful exposures can be made near the goal with an ordinary hand camera at $\frac{1}{50}$: but for following the game along the field a focal plane camera is essential. It is a good plan to photograph the players as they either retreat from or advance toward the lens; this admits of a somewhat longer exposure. Broadside subjects occasionally "miss the plate." Some workers fix the speed of the shutter be-

Ross Homocentric and Multi-speed Shutter G. Dietz

fore commencing and do not alter it during the whole of the afternoon, so that, if all the plates are given exactly the same exposure, the first one developed will give the key to the kind of development the rest will need. Strong variations in the light will, of course, necessitate some variations in the speed. One piece of advice of a nonphotographic nature will be found of use:

"It is not always possible to get a clear field of view, and sometimes it is not desirable, as the representation of a row of heads and bodies, though not perhaps artistic, helps to give a touch of realism to the scene. If,

however, you do not get a front position, be careful not to obstruct the view of the people behind. For the football man is apt to convey his sentiments in terms more forcible than polite, particularly if you are blocking his view during an exciting moment."

Cricket

Cricket is a game for the four summer months of May, June, July and August: when the light is at its strongest. The photography of a county game in progress from the spectator's part of the ground is a comparatively easy matter—admitting of exposures as low as the half of a second. No subject is easier, the thirteen white clad figures being distributed over a smooth green sward, the ground being fringed with people and a bright sun shining overhead. The photography of individual strokes, and bowlers' deliveries, is however a matter of far greater difficulty. It then becomes imperative that the photographer should himself know something of bowling and batting and that he should get close up to the work. The best way for the would-be photographer of cricket action to go about the business is to obtain access to the nets, when practice is in progress. Part of the ground is usually netted off for the purpose and here, on off days, and between whiles, the players practice themselves into condition. Let the photographer get permission to place himself within twelve or fifteen feet of the bowler as he is delivering the ball. Focus the crease or stump, and release the shutter when the bowler's arm is raised to make the delivery. An exposure of $\frac{1}{400}$ of a second will probably show the bowler's particular "action," or method of delivering the ball. Similarly with the batsman. Take up a position some eight or ten feet to his "on." You run the risk of a hit from the ball when he strikes it: but that is a part of the business in hand, and if anything untoward happens the matter can be referred to the casualty insurance company. These corporations have unlimited funds for dealing with such cases. Focus the batsman as he stands waiting for the ball, never mind the bowler, and when you see the bat rising to meet the oncoming ball release the shutter. An exposure of $\frac{1}{500}$ of a second, in the most favorable circumstances, should

secure a sharp result. A dozen exposures made in this way should give the photographer sufficient confidence in himself to be able to photograph an actual game—if he can get sufficiently near the wickets for the purpose, remembering that it is the characteristic attitudes, deliveries, and peculiarities of the batsman and bowler that it is his business to portray. These things vary with the individual and are always of supreme interest to the expert and the reader of sporting literature.

Photographs of batsmen running, of fieldsmen in motion, of the wicket-keeper in position, of attempted catches, come within the sphere of comparatively low-speed work from a distance of hundreds of feet: the principal work is done around the wickets at high speeds. Here the exposures will vary between $\frac{1}{400}$ of a second and $\frac{1}{1000}$, as the motions of the players and ball are exceedingly rapid. The speed of the ball as it leaves the bowler's hand varies with his pace; and so with the hitting power of the batsman. Its speed probably ranges from fifty feet to two hundred and fifty feet a second, its highest rapidity falling short of that of a golf ball.

To avoid danger in taking photographs around the wicket, some expert photographers use a stand for the camera and an electric release for the shutter, placing themselves well out of harm's way. As a rule the best work in photographing cricket will be done by arrangement with high-class players in practice. They can then be persuaded to give their characteristic strokes just as if they were actually playing. The presence of a photographer on the field of play is tolerated only in minor matches. Obviously he is not wanted when a county contest or a championship is in progress. Thus the sporting aspects of cricket to be shown in detail must be photographed, as it were, in rehearsal.

Tennis

Grouped with this pleasant summer game in the minds of most people are badminton and croquet. The latter, played with mallets and wooden balls through rings and hoops, does not call for very high speed work. It is a game of skill played in a deliberate manner, and an ordinary hand camera giving exposures from $\frac{1}{4}$ second

to $\frac{1}{100}$ is quite equal to the photographic work required. Badminton, with its smashing volleys over a net, necessitates focal-plane exposures of $\frac{1}{400}$ to $\frac{1}{1000}$ of a second, the ball being struck with great force and the player requiring to be very agile in his movements: the game, however, is not very much played. Lawn tennis, however, is enormously popular in America and other parts of the world and is the subject of many coveted championships.

Wallace McGregor, a well-known Scotch player and successful photographer of the game, advises that for fast strokes, where an accurate picture of the ball is to be obtained, a shutter must be used capable of an exposure not longer than $\frac{1}{400}$ of a second. Therefore, he advises the best apparatus one can afford, quarter-plate for choice, as in any case they would wish to enlarge their prints. His own apparatus at different times included an early variety of kodak, an ordinary magazine camera for twelve plates, a "Challenge" camera with a focal-plane shutter, and a Goerz-Anschutz. The lens, however, is the most important part of the apparatus, and should be capable of giving good definition at a large aperture, and also of being easily focussed. His Goerz lens worked at *f*/4.8, which enabled him to get good results at high speeds in comparatively poor light, and the focusing, effected by a small lever attached to the lens mount, was easy. The shutter must be of the focal-plane type, and he recommends the use of Imperial flashlight plates. Like other experts, he is emphatic on the necessity of the photographer knowing something of the game before attempting to make pictures of it, so as to be able to recognize what pictures are worth taking, and how and when they should be taken. Another essential for success is patience. It is also desirable to study the styles, strokes, and temperaments of the players to be photographed, and if, in addition, the photographer can make their personal acquaintance, some unpleasant incidents may be avoided, as an irascible player may very easily accidentally propel a ball in his direction with disastrous results. In every case, the photographer should be as unobtrusive as possible, as the very sight of a camera

Dr. Nathan T. Beers

disturbs many players, and the obtrusive photographer generally becomes very unpopular.

Lawn tennis is not an easy game to photograph, on account of the extraordinary velocity with which the ball is driven and the agility of the players; but the disposition of the game itself, while it is in progress, makes pleasing photographs. "The service," i. e., the manner in which an individual player strikes the ball, is the one important phase of the game the photographer should, and does aim for. One writer on the subject recommends that before exposing a plate it is best to wait during a couple of games to observe the characteristics of the server and decide how one is to photograph in order to exhibit most typically any special peculiarity that may have been observed, or previously heard of. One player may be noted for the remarkable height to which he throws the ball; for a picture of this description one would aim at snapping when the ball was at its maximum height and actually for a certain fraction of time at rest. A comparatively slow exposure can be given, since all movement—of player as well as of ball—is suspended.

The style of service varies with the individual player. One may throw a whole world of energy into the stroke, the racquet being flung well back and driven to meet the ball with enormous force; another player may exert the same force with apparently less effort. Good players nearly invariably serve from the same position on successive occasions, so that preliminary focusing is possible; they also vary their action at times. A player waiting to smash a ball which has been served to him makes a good subject for an exposure. As an exercise in training hand and eye, Adolphe Abrahams suggests the photography of a service which depicts the ball at the very instant it meets the racquet. He finds the exposures in taking the service $\frac{1}{250}$ to $\frac{1}{800}$ of a second, according to proximity. Good photographs with exposures so long as $\frac{1}{50}$ can be secured; the ball will be sharp, but in all probability the racquet or some part of the player will be blurred. For other incidents in the game, the focal plane shutter must be driven at its fastest.

Horse-sports In this section we include horse-racing and steeple-chasing, trotting, polo, and military sports. Hunting we are treating in a separate section. First of all, the photographer must always be prepared to give the fastest exposure his shutter is capable of, $\frac{1}{1000}$ of a second in a clear light is a quite common exposure on either trotting or galloping horses at a distance of 60 to 150 feet: in the latter instances the exposures may be $\frac{1}{500}$ or less. In racing, steeple-chasing, jumping or trotting photographic work, there is one formula only to adopt; focus the point where the animal will come on the focal plane; set the

Dr. Nathan T. Beers

shutter and at the proper moment release it. The work is of course not for the inexperienced; a great amount of nerve, patience, horse-knowledge and a thorough command of the camera are indispensable. Nevertheless, it is a branch of photography which well repays the labor of application. W. A. Rouch, a most successful photographer of steeple chases, traces his results to the exercise of patience, and his experience of steeple-chasing. "One gets to learn," he says "after seeing a large number of races, that certain jumps are difficult to negotiate and likely to cause trouble. I take up my position as unobtrusively as possible and wait." We have seen

Mr. Rouch at work on a race-track: He is coolness, patience, and nerve personified.

Most press photographers work from a stand on the course or track; the focal-plane camera user has a better choice of a subject. Generally speaking, in flat racing and trotting, a position some 60 to 100 feet from the horses should be chosen; in steeple-chasing one should, if possible get nearer. As a rule he will be unhampered by exigencies of space, and can make very fine studies, provided he is not limited by time in development and printing. Polo, military sports, tent-pegging, lemon-cutting, and the horse sports of a camp, are comparatively simple subjects to photograph. The worker will be stationed some two or three hundred feet away and exposures of $\frac{1}{250}$ of a second will be about approximately correct. The defect of most published photographs of horse sports is that they are too large; the amateur worker is not bound to get so near, and can handle his subjects with a closer regard to pictorial effect.

Racing either on the flat, or across country, takes place all the year round. In winter the races are frequently run in a very poor light, so that the exposures must be increased accordingly. In the open country however there is seldom any difficulty in obtaining negatives of the subjects, the light generally being strong enough for the purpose in these days of rapid plates and films.

Hunting

For our purpose, hunting, like horse-sports, embraces several kinds of field sports, which can be conveniently treated under a common heading. Fox-hunting, stag-hunting, deer-hunting, hare-hunting, are the principal sports; and as horses and dogs, as well as the hunted, huntsmen and spectators take part in the field work, the photographer will have many opportunities for making pictures, both from horseback and on foot. Those pictures will chiefly consist of incidents in the chase. A combination of great skill and alertness will be necessary to secure a kill with the fox-hounds, or the finish of a stag-hunt with the animal "at bay," or in a river. You must be right up with the hounds to get such negatives, but they are worth trying for.

Whether photographing from foot or from horseback, it must, first of all, be borne in mind that as hunting is a winter sport, and a good day for it is not necessarily a bright day, nor a clear frosty day, but one with clouds overhead, a large aperture lens, quick plate, or films and a rapid shutter are essential. Most of the negatives obtained will be groups of dogs and huntsmen; studies of "the field" at rest or in flight; kenneling a pack and striking incidents as they occur throughout a run. If the photographer works from horseback, the camera should be light, strong, compact, easy to hold, with no loose parts to rattle and cause dust or to break, and a strong leather case padded inside so as to fit tightly; an anastigmat working at *f*/4.5 or *f*/6, and a focal plane shutter. The 3A Graflex camera answers the purpose admirably. Some photographers of hunting subjects carry, in addition, a camera of the box-form Kodak type that is always ready for use for chance snaps.

H. M. Lomas, a well-known worker with the hounds, uses a quarter-plate Shew's focal-plane eclipse, having a Thornton Pickard focal-plane shutter built into it; an anastigmat lens whose largest working aperture is *f*/6; a changing box (bag pattern) with twelve sheaths carrying glass plates, and a brilliant finder to slip on to the top of the camera when in use; though when on horseback he works without a finder, simply holding the camera at the level of his eyes and sighting it on the object. This all goes into a well-padded leather case, with shoulder strap worn short on horseback, so that the camera is kept steady between the arm and the hip. Lomas adds that, hunting in a country where there is hard jumping, one must be content to use a very small camera when on horseback and do the focal-plane work on foot, or else not go straight, but make for gates and jump as little as possible. For general work in the hunting field, horses trotting, etc., $\frac{1}{50}$ of a second is fast enough, but galloping horses and studies of hounds in full cry, especially when near to and crossing the plate, need shorter exposures—$\frac{1}{150}$ to $\frac{1}{400}$; a horse jumping at a distance of 25 to 30 feet will need $\frac{1}{800}$ of a second.

When working on foot, harriers or foot-beagles give

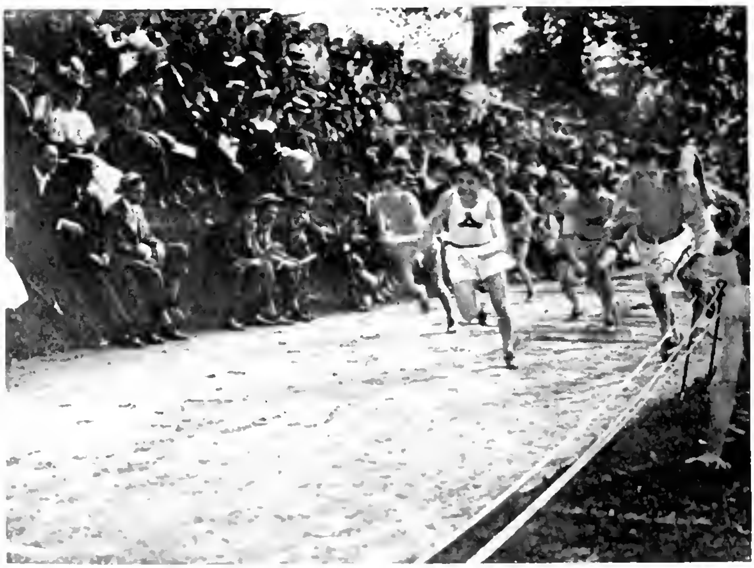
good opportunities for exposures, as they come to the meet, moving away with the riders, or changing and regrouping themselves. Be ready for a hare getting up, and keep as near to the dogs as possible, rather to one side of the rest of the field, standing still to give the exposure. The hare often runs in a circle, so keep inside it, and do not get ahead of the hounds or cross the line the hare has taken. Keep as far out of the sportsmen's way as possible. In fox-hunting, when the hounds are thrown into cover, one may snap at the huntsmen cheering them on; then wait by the whip where they expect to break covert, and try for him, or at the hounds as they break away; then get the field as they go away, or as they crowd through gaps or gateways. Good subjects are afforded by the "kill," as the hare or fox is taken from the hounds, as the huntsman dismounts and breaks up the fox, as the mass of hounds eat their fox.

Be careful to watch how the riders and hounds arrange themselves, then make an exposure. Chance snapshotting should be avoided. If on horseback, your horse must require to be held occasionally, as he sometimes gets restive at critical moments. The advantage of working on horseback is that you may see the hare, fox or stag cross a certain spot; you ride quickly to it and take up a good position well to one side of the spot, and snap the hounds and the field as they sweep up.

Cycle Racing

There is one supreme point of interest in cycle racing, and that is the winning post, although, if the contest is a spirited one, any part of the track may be chosen for an exposure. The photographer should station himself on the opposite side of the track about thirty feet from the riders, whom he should photograph as they approach him. Focus the spot where the riders will pass, and as they race at top speed give an exposure of $\frac{1}{1200}$ of a second. This should give a negative showing riders and cycles quite sharply. As in all other work, the exposure must be varied according to distance, value of light, and the speed of the machine; the exposure given is the minimum for all conditions at the most favorable juncture of factors.

Foot-sports Walking, running, jumping, hurdle-racing comprise a group of out-door sports sometimes known as athletic sports; for our purpose they are best called foot-sports, so as to class them by themselves. The walk ranges in distance from one mile to fifty; in running, there are the hundred yards, the two hundred, the quarter mile, the half mile, the mile, the four-mile, the long jump, the high jump; in hurdle racing, the one hundred and twenty yards is a popular distance. Cross country run-



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ning from five to ten miles is also much in vogue. The latter usually takes place in winter, and gives many opportunities for camera work.

We will confine ourselves to foot-sports on the races ground; they mostly take place in summer under the auspices of clubs and colleges. The hundred yard-running race is the most popular event; the distance is covered approximately in ten seconds from the scratch, so that a high velocity is attained. Roughly, it calls for exposures of about $\frac{1}{1000}$ of a second, at a distance of thirty feet, at right angles to the camera. As in most foot races, there are two points of chief interest to the

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photographer, the start and the finish. The start is best photographed when the pistol fires. The men bend forward and wait for the signal. If the photographer stands at a distance of from twenty to thirty feet and has focused the spot, an exposure of $\frac{1}{200}$ of a second will be quick enough, assuming a good light and other favorable conditions. Rapid movement does not come until after the first stride. If the photographer is taking the finish, he should choose a position in advance of the tape some twenty or thirty feet away, and on the side of the track farthest from the tape-holder. Having focused the tape, snap when the leader has breasted it, giving an exposure of $\frac{1}{450}$ of a second, though as little as $\frac{1}{1000}$ of a second may be required, according to circumstances.

These rules apply to the starts and finishes of other rapidly run races. Walking races come within the sphere of comparatively long exposure hand-camera work down to, let us say, $\frac{1}{50}$, or more. The hurdle race is, of course, best photographed in one of its intermediate stages. Focus on one of the obstacles and, as the men rise, give an exposure of $\frac{1}{200}$ at a distance of twenty-five feet. Long races should be photographed at an early stage when the men are well together, and before they have begun to fall off. It is of course possible for the photographer to get nearer, on special occasions, than the distances mentioned. Especially in the intermediate stages of races, large-sized figures well repay the trouble.

The best and most satisfactory work in foot-sports photography is done either at the start or the finish of a race, for then the photograph tells its best story. The long and high jumps are obviously best taken from a fixed point. In the former, a point midway between the estimated distance should be focused on and an exposure of $\frac{1}{500}$ of a second at a distance of twenty feet given; in the high jump, about the same exposure should be given just as the man clears the bar.

Hockey and Lacrosse

The details of football photography apply to hockey, and authorities agree that for making exposures the best positions to select are near to the touch line or behind a

Graflex: Cooke lens F 4.5. 1-1100 second

Lacrosse: Dr. Nathan T. Beers

Graflex: Cooke lens F 4.5. 1-1100 second.

Lacrosse: Dr. Nathan T. Beers

goal, slightly to one side. Be ready to expose on any group or incident that occurs in the field of view. Hockey is a winter game, and the most characteristic groupings are obtained near the touch line; whilst individual figures dribbling the ball make good subjects. The exposures will range from $\frac{1}{200}$ to $\frac{1}{500}$ of a second, the movement of the figures being only of medium rapidity. Lacrosse, on the other hand, is one of the fastest games, the men moving very quickly and the ball being whirled at remarkable velocity, exposures at $\frac{1}{1000}$ of a second being necessary. Random exposures are called for, owing to the varying nature of the game, which takes place all over the field, depriving the photographer of a fixed point to aim at. A position behind a goal, after a shot has been made at it, gives an opportunity for getting a good grouping of figures.

Golf

In this game, not only the ball but the limbs and the clubs of the players move with great velocities, so that in those respects there are similarities between golf and baseball. The game is played all the year round, thus offering many opportunities for obtaining photographs of it. An observing walk around the links whilst a "twosome" or "foursome" is in progress will acquaint an intelligent photographer with the necessary strokes and rules of the game, so that negatives of its principal aspects can be got without much difficulty, the ordinary golf course usually being in the open country.

The photography of vital moments in an important contest, however, demands that the man with the camera must also be an expert golfer, otherwise justice will not be done to the work. The first subject the photographer will attempt is the drive from the tee. In this, after the player has addressed the ball, he raises the club at a comparatively low rate of speed; it descends with increasing velocity, strikes the ball, which then travels off at its estimated speed of 300 feet per second, whilst the club, following through, swiftly completes an almost circular swing.

George W. Beldam, a successful English photographer of golf, gives the following hints on the work: It is all a question of eye and hand, as in any other game,

but two things besides are most necessary—a camera with a full-sized view-finder and a focal-plane shutter, and, a knowledge of the golfing swing,—in other words, the camera artist must be a golfer. The fact that when the button is pressed the full-sized reflector springs up and releases the focal-plane shutter really helps the operator to time more perfectly. There is only a fractional part of a second between the pressing of the button and the releasing of the shutter; the reflector has to spring up to get out of the way, and release the shutter. Hence I soon found I had to allow for this, and "press the button" just before I wanted to. This short space of time, in my opinion, just fits in with the golfing swing, and also compensates for the difference there would be between the eye seeing and the hand pressing. I therefore watched the wrists working, and not the club head, and I soon found that practice gave me the necessary knowledge when to press. I seemed to know if one had been mistimed, and immediately took another of the same stroke.

When taking a great number in one day, I seemed to get set, as one does at cricket, and could then be certain of my efforts being absolutely timed. The top of the swing, of course, requires more timing than the finish, but the most ticklish thing is to catch the ball at, or immediately after, impact in the drive, so as to show the ball and driver on the plate. Of course, in such a case, there is considerable movement of the club and the ball, but this gives a better idea of the pace at which they were traveling, especially when it is remembered at what speed the shutter was working, viz., at $\frac{1}{1000}$ to $\frac{1}{1250}$ of a second.

In following the game of golf with a camera, the photographer can usually get within forty or fifty feet of the player, except at important matches, and he will find no difficulty in focusing the striker as he takes up a position by the ball. The camera should be quite noiseless in action, otherwise it may distract the attention of the player and put him "off his game"—an unforgivable sin at golf. Stand with your back to the light, if possible, and take up a position so that you can see the player's face as he addresses the ball; then

release the shutter as the club descends to strike the ball. To get the club defined in the photograph, an exposure of $\frac{1}{1000}$ part of a second will be necessary with favorable conditions of light, lens and plate. We are quoting from an actual experience with successful golf photography. Brassie shots will require the same high speed as the drive, so will cleek shots: in both these

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the player uses the club with nearly the same force and rapidity as he does the driver.

In the "bunker," where the problem is to lift the little white ball out of a sand pit or some hazard, a cloud of dust or sand is not infrequently an accompaniment of the ball and the highest rate of speed is not necessary. Here $\frac{1}{200}$ of a second at a distance of 40 feet may be safely attempted. On the putting green, where the ball is simply tapped into the hole, an ordinary hand-camera exposure will suffice.

There are four characteristic strokes at golf which the photographer should attack: the drive; the brassie, or "approach" shot; the iron or bunker shot; the "putting" shot on the green. Theoretically a good player

"holes out" in three or four strokes; practically he may take five strokes to a hole, or even more. The object for the photographer to keep in view, however, is to select the characteristic shots of good players and not to waste exposures on duffers. Characteristic attitudes and incidents of a game make good photographs; the crowds, the scenery, the greens, the hazards, are pleasing natural backgrounds. One ungallant writer on the subject advises the golfing photographer not to take lady golfers, as the bodily contortion of a violent stroke makes for ugliness. In our observation and experience, this is not good advice: graceful lady golfers make good subjects for camera treatment, and the "swirling skirts of womanhood" lend variety and piquancy to the photograph.

Water Sports

Swimming, diving, and water polo are carried on chiefly in summer, and to the best advantage in the open air, so that reflection from the water and the comparative openness of the surroundings make the photographic work simple and the results easy to obtain. Swimming photographs are best obtained by following the contestants in a boat; the results, however, are seldom very satisfying,—an uplifted arm, or a head just out of the water, being generally all that is obtainable. With smooth water, exposures of $\frac{1}{50}$ of a second, at a distance of fifteen to twenty feet, will give good results. Water polo, when played in the open, gives diverting-looking results. These are best obtained by focusing the center of play and giving exposures of, say, $\frac{1}{100}$ of a second. The work is comparatively easy. This remark applies with some qualification to diving, which offers good subjects, nothing looking so striking as the sharp figure of a man in mid-air dropping into the water.

For the benefit of modern focal-plane workers, it may be mentioned that Louis Meldon, of Dublin, took such a subject quite 25 years ago, giving an exposure estimated at $\frac{1}{500}$ of a second. In 1882, military athletes falling from a bar were photographed quite sharply with a drop-shutter a wooden panel with an aperture passing across the lens. Divers mostly move at right angles to the camera. If possible, the photographer should place himself in a position where he can com-

mand and focus the diving-board. The exposure can then be made at any point of the diver's progress from the board, through the air to the water. Preferably the exposure should be made very soon after the man has left the board, in the case of a rebound or stationary dive; in the case of a running dive, the exposure should not be made quite so soon. The diver generally moves in a straight line, so that the plane focused on will remain constant. Feat or trick diving is not more difficult to photograph than straight diving; a pier head is a good place to work from; photographing from a boat is more difficult, owing to the vessel's movements. The exposures range from $\frac{1}{300}$ to $\frac{1}{1200}$ of a second, and a focal-plane camera is essential.

Sailing

This is a wide field of work, varying with the tastes of the individual, who may, if he is of the disposition, include yachting in its scope. It is a debateable point, however, whether the photography of yachts is not of itself a sufficiently large subject to demand a separate treatise of its own. We shall solve our own difficulty by including a few hints on the work culled from the experiences of F. J. Mortimer, who has produced many good negatives of racing and pleasure yachts. The season for the work is in the summer, when "the sport of Kings" is in progress at New York, Cowes and other great centers.

Serious yacht photography, according to Mortimer, can be accomplished only when the photographer himself is himself on the water in another boat. It is necessary that the standpoint should be capable of being quickly altered. There are three good standpoints: 1. The photographs may be taken from another sailing yacht well under control; 2. A small boat may be used and manœuvered so as to get into the track of a race; 3. A power-boat, such as a steam launch or motor-boat, may be employed. By this method a race can be followed, the boats photographed at any point or distance, and it is possible to circle round a fleet of racing yachts and secure a variety of pictures. It is advisable not to get too close to racing yachts, as it is not so much the danger of being run down that is to be

feared as the sweep of the boom which may clear the decks of a smaller craft. The focal-plane shutter, unless the camera is a small one, and the shutter used at a high speed, is not a success for yacht photography. In nine cases out of ten a good before-lens shutter of the roller-blind type, such as the Thornton-Pickard T. & I., will give a better and cleaner rendering of a racing yacht taken at close quarters, than a focal-plane shutter working at a normal speed. This advantage is marked when the racing yacht is taken nearly broadside on and traveling at a high rate, while the boat from which the photograph is taken is nearly stationary in a tossing sea.

"The appreciable time that a large focal-plane shutter takes to pass across the entire plate is apt to be productive of a slight blurring distortion, which becomes very marked in viewing the fine, straight masts and spars that are vertical, or nearly so. The light is nearly always good enough on the water to drive a before-lens shutter at its highest speed with a fairly small stop—about *f* 16."

The camera advised is the rigid-box form, because it is not only easier to hold, but better protected for hard wear than other cameras. In fine weather a reflex enables a moving object to be focused up to the instant of exposure. The camera should be covered up with a waterproof focusing cloth and protected as much as possible from the salt spray. A direct vision-finder is advised, made of wire the same size as the plate; this should be divided by cross-wires into quarters, and fixed to the camera front over the lens so that its base is level with the top of the camera. By holding the camera at the eye level and aiming it like a gun, so that the picture is enclosed in the wire frame, the actual view itself is seen. Very fast films or plates are not necessary, owing to the high actinic value of the light; high-speed orthochromatic plates and light filters can be used, so that gradations of light and color between white sunlit sails and blue sky and clouds can be secured.

Mortimer gives exposures of $\frac{1}{100}$ of a second for such work. A great deal of this advice, in our experience, can be switched from the photography of racing yachts to the photography of smaller sailing boats, such as

those on rivers and lakes; the work does not come within the scope of specially made cameras, but rather in that of ordinary hand camera photography with exposures ranging between $\frac{1}{10}$ and $\frac{1}{100}$ of a second. Indeed, the simplest form of Kodak answers for the purpose; the subjects make pleasing photographs, and the work is so easy that it needs no special description here—small sailing boats do not move very quickly, are easily focused, and permit of comparatively long exposures, the finder image giving a good guide to their position on the focal-plane. For this work a focal-plane camera is not imperative.

Rowing

The camera user may photograph rowing either from land or water. The work is simplified by the fact that there is reflection from the water, the boats, the oars; that the contestants are invariably clad in light colored garments; and that in winter there is no foliage on the trees,—all of which makes for lengthening the exposure. College eights, fours and pairs are favorite subjects on rivers; so, too, are sculling races, and where the competitive or championship element enters into the contest the interest adds zests to the photographic work. Coast rowing is of a sporting nature, but the photographic aspect of it calls for little notice. Mostly the open sea supplies a background for a subject which, taken at a distance, probably, of many hundreds of feet, requires only ordinary hand camera treatment. In fresh water rowing the conditions are different, and the photographer generally finds himself working from a river bank. Favorite subjects are college or university eights or fours, and these with pairs and singles furnish the sport at most regattas.

The work does not require the utmost rapidity of shutter. The rowers move like so many pendula in one plane, never at a greater velocity than twenty miles an hour, so that from a river bank exposures of from $\frac{1}{50}$ to $\frac{1}{100}$ of a second will be found satisfactory even in dull weather. In summer the exposures may be even less, especially in July at Henley, the world's great rowing carnival, where the cream of American, English, Canadian, Belgian and Dutch rowing talent competes.

Racing boats vary in length: an eight being sixty feet or so long; a sculler, twenty-five or so; fours, forty-five to fifty-five. Eights and fours obviously make the best photographs, on account of the presence of the figures. The commencement of a stroke is the best for making an exposure, and if the photographer can place himself high up on a following boat, or on a bridge, and point the camera down on to the water, then an ideal action picture may be got. Following the crew in a launch and keeping within a distance of from fifty to sixty feet is another good way of taking views at an angle. Crews putting off from the boat-house, tubbing and practising, make good subjects, but, owing to the size of the craft, the further off the photographer can be and the longer the focus of the lens he can use, the more of the subject he will include in his negative. The back-half of a seven-inch symmetrical lens gives a focal length of fourteen inches; this stopped down to *f* 16, and with the shutter set at $\frac{1}{200}$, is a good trial system to adopt for casual work, where the photographer is not bent on securing actual racing records, but rather interesting snaps at practice and so forth.

To photograph an eight or four in racing going a good opportunity may be seized from the river bank, if the photographer can get a position in waiting. An exposure can be made on the boat as it comes into the field of view, the plate changed and the shutter set, while it is passing, and another exposure made as the boat draws away. Some photographers are also clever enough to get a broadside view in the time, but great adroitness is called for. Endeavor to make an exposure when the men are right forward, with the blades square and about to drop in the water; this will give an effective and life-like result. On such a subject an exposure of $\frac{1}{100}$ of a second has given a good result.

Rowing photography is less difficult than some other branches of the work, and a reflex camera is the best all-round camera to use. The principal thing to bear in mind is to secure either in the following boat, or from the river bank, such a position as will allow the photographer to snap the characteristic action of the men in drawing their blades through the water. This also

applies to sculling. A famous photograph of Hanlan, the renowned Canadian oarsman, was taken on the water at a distance of 50 feet in the fiftieth of a second. In 1878, the English University boat race was snapped with a simple drop shutter—exposure probably $\frac{1}{20}$ of a second—from the deck of a following steamer. These photographs have never been excelled.

Angling Followers of the gentle craft are very often photographers, as we know, but the best pictures are made by those who are content for the time being to let somebody else handle the rod or the line. The ordinary incidents of coarse fishing—pike, jack, barbel, and the other prey of rivers and lakes, are well within ordinary hand-camera treatment; so, too, is sea-angling, that is, fishing with a line from a pier or an open boat. The characteristic attitudes of anglers with the rod, the play of the fish in the water, and the landing, are not incidents of remarkable velocity.

Photographing a leaping fish, especially if the creature be of the size of a tarpon, is a matter of special difficulty. Julian A. Dimock, who has succeeded in the work, tells how he does it, and the hints he gives are applicable to all kinds of sporting angling. He advises the use of a hand line and playing the fish to encourage his aerial performance. The chief trouble is to know where, or at what distance from the camera, the fish is going to jump. To overcome this trouble, Dimock marks his line with ribbons, so that he can keep tab on how much line is out. At 25 feet from the hook is a red ribbon, at 50 feet is a blue one, at 100 feet a white one; thus the distance of the fish can be approximated. If at the moment of the jump the line is taut, the mark accurately gauges the distance, and if he jumps straight up a sharp image will be obtained if the camera has been focused for a corresponding distance. A scale on the camera is necessary; whilst one which can be focused by sense of touch alone is useful, as then the eyes are free to watch the marks on the line and to follow the direction of the fish. The difficulty is that the fish cannot be held at a particular mark and that he may not jump straight up,—his movements are notoriously erratic.

Dimock discounts the practical value of sights, or cameras in the form of a gun, and urges that a little practice with merely holding the camera on the knees or against the chest will enable one to center the object on the plate and in most cases to keep the horizon line level. In practice, he sits aft in the boat, as far toward the stern as he can get, the fisherman on the thwart behind him, the oarsman rowing from the forward seat. It rests mainly with the man at the line to keep the tarpon where he is wanted, and this by playing him with a light strain between times while you are changing plateholders, or when the fish comes in on the line, or by putting on a heavier strain when he seeks to run away. No dependence can be placed on the jump of the creature—when or how or where it will occur: it is quite "up" to the photographer to be ready for the exposure, and make a dead shot as often as he can.

The exposures vary from $\frac{1}{200}$ to $\frac{1}{500}$ of a second, and the stop of the lens from full aperture to *f*/16; he has made exposures with a ray filter; but light, surroundings, and condition of the water make this a variable quantity. His partiality is for a lens fairly wide open so as to get a fully-timed negative. Philosophically he adds: "After all, the length of exposure and the stop used are of small account. Get the fish in front of your camera; have the focus approximately correct, and you can hardly spoil the result." Not every reader of this monograph will go tarpon fishing; but the practical hints given on the photographic side of the matter will be found to apply to most kinds of angling.

Quoits, Bowls, etc. Amongst people in country places quoits is a favorite game, as it comes in the category of sports for the leisurely and mature. Ordinary hand-camera work suffices for its photographic treatment. One may approach to within a few feet of the man with the ring and his characteristic attitude, as he is preparing to cast it toward its objective, is easily snapped at $\frac{1}{50}$ of a second. The ring travels comparatively slowly through the air and with the photographer standing thirty or forty feet outside the line of play the scene is easily shown at an exposure of $\frac{1}{50}$ of a second.

Bowls is even easier to photograpn, as the ball travels along the smooth greensward at a low rate of speed. The bowler kneels to his work and sends the ball along the ground in deliberate fashion; there is no stress of movement throughout, so that camera exposures even so prolonged as $\frac{1}{10}$ of a second may be tried.

In some parts, wrestling, Scotch reels, outdoor dances are made much of—they fall within the local idea of outdoor sport. As subjects, they are easy of photographic treatment, exposures of $\frac{1}{30}$ of a second at a distance of thirty or forty feet being necessary. Great rapidity of movement occasionally takes place in them, but, as there is comparatively little displacement of the figures on the screen, it is a simple matter to focus on the scene and make the exposure at the proper time.

Made with a Graflex. Scottish Dance

Ice-sports

The actinic value of the light, when out-door sports take place, is not so great as in summer, but in most ice-bound or winter resorts it is usually so bright that rapid exposures are possible. Tobogganning, ski-ing, skating, ice-yachting or wind-sailing are popular with visitors to Canadian winter resorts and similar places where low dry temperature prevails for a length of time. They need the greatest rapidity of exposure. To express the idea of movement in progress and not momentarily arrested, it is necessary to try and get a position where the figure

appears as if it must move by reason of the apparent steepness of the slope it is on, in tobogganning and ski-ing. Movement can also be suggested by the presence of flying snow from a ski-stick, or a tobogganning rake, or by taking a rider while still in the air during his leap on to his machine.

Mrs. Aubrey Le Blond, who has succeeded in this work, uses a focal-plane camera, and recommends a well-made instrument for the purpose, as excessive dryness often causes the cheaper forms of cameras to split up. A half plate Xit by Shew, of London, with an 8-inch Goerz lens, she considers an ideal camera; it is

Made with a Graflex.

lighter to carry than many smaller sizes of different construction. With it she advises the use of the most rapid plates available. The smallest width of slit but one gives a sharp image of a rapidly moving object; she works the shutter at the fastest speed without risking overwinding, using the lens at $f/6$ on cloudy days or in the shade, and $f/11$ in brilliant sunshine at mid-day. She holds the camera in the hand, pointing it to the spot where she intends to take the figure, and lets off the

shutter the instant that the object is where she intends it to appear. The shutter should be released when required, neither sooner nor later, by means of a bulb, or else pressed sharply with the finger; a gentle pressure tends to show the exposure.

In skating, there is "a moment of rest," so that the exposure need not be so brief as in ski-ing. The camera may be held, in this work, within twelve or fifteen feet of the moving figure. Snow reflects a great volume of light, a fact to be remembered in determining the exposure.

In ice hockey, we are dealing with objects moving at a fairly low rate of speed, and the photograph can be taken from a comparatively great distance, say fifty to a hundred feet. The photographer of ice-sports is greatly dependent on climatic uncertainties, except in the winter in Norway, Switzerland, Canada, the Austrian Tyrol, and such like regions; in those places, the settled conditions of winter, the great power of the light, and the sports mentioned, give him the opportunity of making rapid focal-plane exposures on interesting subjects.

BOOKS

Advanced Hand-camera Photography. By W. Kilbey. 121 pp. Illustrated. 1904. 50 cents.

THE PHOTO-MINIATURE, No. 77, "Focal-Plane Photography." 48 pp. Illustrated. 1907. 25 cents.

The Hand Camera and Its Use. By Wastell and Bayley. 204 pp. Illustrated. 1905. 50 cents.

Hand-camera Work. By W. Kilbey. 121 pp. Illustrated. 1903. 50 cents.

Notes and Comment

When Mr. H. Snowden Ward, F. R. P. S., the editor of our London contemporary, *The Photogram*, arrives in this country next fall, he will undertake a two months' lecture tour. His dates are available from December 14, 1908, to February, 1909. The subjects of the lectures are Shakespeare at Home; the Real Dickens Land; the Canterbury Pilgrimages; the Land of Lorna Doone, and the Marvels of Photography. Mr. Ward's arrangements are in the hands of the J. B. Pond Lyceum Bureau, New York, and we understand that several dates are already booked.

In more than one place in this month's monograph on the photography of out-door sports, we quote the experiences of photographers with the "Imperial" plates G. Gennert, New York, is the American agent for these plates ("that brown box with the red label"), and he stocks all brands and varieties of them. "Imperial" plates have a great sale all the world over. They are of very fine quality.

The Fifth American Photographic Salon has been announced. Entries must be in the hands of the American Federation, 5 Northwestern Building, Chicago, Ill., by October 1, 1908. The Secretary, who will answer all inquiries, is Clarence F. Hale, 215 Jackson Boulevard, Room 506, Chicago, Ill.

Gaslight papers, it is predicted, will be more popular than ever this coming fall and winter. The reason is not far to seek; they are so easy to work. Argo paper made by the Defender Photo Supply Company, Roches-

ter, N. Y., is increasing in popularity by leaps and bounds, here and abroad. The paper is made in about thirty different grades, and amongst the company's other products are Disco Printing-out paper, Monox Bromide paper, Ampere Collodion paper; the Defender, King and Queen Dry Plates. The catalogues of the company, which can be obtained from the address given, will surprise the reader by the number and variety of the company's specialties.

The Fifty-Third Annual Exhibition of the Royal Photographic Society of Great Britain, will be held from Thursday, September 17 to Saturday, October 24. It will be divided into five sections—pictorial photography, scientific, screen-plate color transparencies, professional and commercial, apparatus and material. Entries should be sent to the secretary, R. P. S., 66 Russell Square, London, England.

"Ingento" photographic supplies occupy positions of prominence in the new catalogue of Burke & James, Chicago. And deservedly so, for are not Ingento branded products popular all over America, and many other countries? This new catalogue is a very finely produced book of 280 pages, and it reflects great credit on the progressive western house that compiled it. Well illustrated and complete we find ourselves turning over the book with pleasure and approval of the Burke & James enterprise. It will repay the reader to send for a copy of this catalogue.

Ten cents forwarded to George Murphy Inc., 57 East Ninth Street, New York, will secure a copy of the firm's 1908–1909 catalogue, a lavishly illustrated book of nearly 300 pages, which, whilst it primarily appeals to the wants of the professional photographer, all the same gives the amateur an equal share of attention. The book is so full and complete that the puzzle is to find any specialty or staple omitted that the photographer

is likely to require in his work or business. As indicating the stock of goods held by one of New York's leading photographic stores, this catalogue should be constantly at hand for reference.

The American Annual of Photography, for 1909, will be published next November. Actually at this moment many of the articles are in type, and the illustrations are being prepared. The world's chief workers in photography are contributing to its pages, and it is with some feeling of pride that we anticipate the pleasure of issuing a volume which will easily eclipse all its predecesors in value and utility. *The American Annual* for 1909 will be quite worthy of modern photography.

Burke & James, Chicago, have recently purchased a lot in the St. Clair district of that city, measuring 200 x 108 feet, on which they plan to erect a new structure of modern design, containing general offices, stockrooms and factory. The company employs about 125 people. Building operations on the new premises will be commenced in 1909.

The June issue of *The Prism*, which appears in an enlarged size, begins its second year of existence. It contains an exhaustive article, by C. H. Claudy, on "The Amateur and the Anastigmat," with six illustrations clearly showing the practical advantages of anastigmat lenses over those of non-anastigmatic form.

The popularity of Autochrome photographs is so great that some convenient device for enabling them to be viewed by transmitted light was bound to be introduced ere long. Such an instrument is sold by L. A. Dubernet, 44 East Eighth Street, New York City. It is called the Diascope, and is a leather-covered case, with door covers and side shutters, which, when opened, support the picture at the correct angle and exclude all

light except that which passes through the picture. When closed the Diascope folds up flat like a book and protects the autochrome. Every lover of natural color photography on glass should procure a Diascope for viewing and preserving the pictures.

"Seventeen Million Pictures" is the title of an illustrated brochure descriptive of the developing and printing department of E. B. Meyrowitz, New York. Since the department was inaugurated, this enormous number of photographs have been developed and printed. Evidently the amateur photographer finds the facilities of this house a great convenience.

"Hammer's Little Book" has reached its eighth edition. The photographer will find it a capital guide to negative-making, which contains many new formulas for tank development, so that it is up to date as well as useful. The booklet is mailed free on application to the Hammer Dry Plate Co., St. Louis, Mo., and the reader, therefore, should not fail to obtain a copy of it.

Photographers of outdoor sports in England very largely use the Barnet "Red Seal" plates; the reader will doubtless appreciate the information that those plates are obtainable in this country of J. L. Lewis, of 379 Sixth Avenue, New York City.

The growing number of photographers who use the time and tank system development will be glad to have a recently issued AGFA booklet, which can be obtained of the Berlin Aniline Works, 213–215 Water Street, New York City. This sets out time-development formulas for AGFA pyro, rodinal, ortol, glycin, metol.

"Graflex Results," by C. H. Claudy, please us immensely; and they will also please the readers of this

number of THE PHOTO-MINIATURE. For about thirty of those results, which were made in the Graflex camera of the Folmer & Schwing Division, are very fine photographs of outdoor sports. Mr. Claudy writes at length of sport and speed pictures generally. The photographer of outdoor sports will, of course, procure a copy of "Graflex Results," which is a capital addition to the literature of the subject that we are endeavoring to popularize.

Three new series of lenses make a very notable addition to the resources of the American photographer; and the fact of itself is all the more notable, that those lenses are made by an American optical firm, viz., The Crown Optical Company, Rochester N. Y. The new lenses are an *f* 6.3 anastigmat for extremely rapid work in the open; a wide angle at *f* 16, including an angle of 100°, for architecture in confined situations; and a portrait rectilinear which works at *f* 6. These lenses give very fine results, as some specimen prints well prove: we are much pleased with the pictorial qualities of a portrait which was produced with the portrait lens referred to. It is also a point in favor of the Crown lenses that they are moderate in price. As a first step toward making himself acquainted with the properties of the Crown lenses, we advise the reader to send for a copy of the company's catalogue, at Rochester, N. Y.

One of the cleverest solutions of the eternal problem of exposure yet offered is the Autotime Scale, which can be fitted to any lens-shutter and, with two simple movements, automatically sets the shutter for the correct exposure. It is simpler in actual use than can be described in a few lines, so the reader is referred to the booklet obtainable on request from the Autotime Company, 1030 Times Building, New York.

With the entry of the famous Steinheil lenses into the American market, we now have all the leading

European anastigmats available for American workers. The United States Agency for Steinheil lenses has been transferred to Messrs. Herbert & Huesgen, 311 Madison avenue, near 42nd street, New York, and a new catalogue, now in preparation, will soon display the powers and special qualities of these splendid instruments in detail.

The Telephoto Quarterly. Edited by Captain Owen Wheeler. "Strathmore," Prince's Road, Weybridge, Surrey, England. Subscription $1. We welcome the first two numbers of our newest contemporary, and we wish it long life and much usefulness. Captain Wheeler is an expert telephotographer and he writes with knowledge and understanding of his subject. The Quarterly should do much to popularize telephotographic work. The June number just to hand contains, amongst much other matter, a useful article on "Instantaneous Telephotography;" and another on "Telephotography for Naturalists." Get the "T. Q." reader; it is well worth having.

"The Wollensak Optical Company have just put on the market a new medium-priced shutter to take the place of their well-known models of the Winner, Regular and Automatic, and the new models show some decided improvements over the old. In all three of the new shutters, which will be called *Vuctus*, *Regno* and *Autex*, the pumps are concealed within the case and the Autex has a special arrangement so it can be opened for focusing. These shutters are now ready in two sizes for use on lenses from 4 x 5 to 6½ x 8½, and other sizes are in preparation. The fact that the pumps and all working parts are concealed within the case is certainly an advantage, as not a few shutter troubles come from the exposed mechanism. Other new goods offered by the Wollensak Company this season are the *Versar F.6* for portraits, groups and landscapes, and the *VeLosithmat*, a new Anastigmat working at F 6.8.

Books and Prints

All books noticed in these pages may be obtained from the publishers of THE PHOTO-MINIATURE, and will be promptly forwarded, postpaid, to any address on receipt of the publishers' prices as here quoted.

The Photographic Annual, 1908. Incorporating the Figures, Facts and Formulae of Photography. Edited by H. Snowden Ward. 284 pp. Price, 50 cents. Postage 8 cents. New York: Tennant & Ward; London: Dawbarn & Ward, Ltd.

In its new and final form of an *Annual*, the first volume of which is before us, "Figures, Facts and Formulae," as it has long been known, takes its place as a permanent book of reference which every photographer should possess. It is the completest volume of useful data for photographic work that we know of. Nor the least of its merits is that it has been brought up to date. For example, autochrome formulae are included; of printing processes, carbograph, ozobrome, bromoil and oil pigment find places; and there are formulae for tank development and the newest orthochromatic sensitizers. The *Annual* has only to be conducted on these lines to be assured of a yearly success. The main scheme of the *Annual* as outlined will indicate its value to the photographic worker. The first section embraces thirty-eight chapters, and figures, facts and formulae are concisely given in relation to the following subjects: The studio and work room, lenses, orthochromatics and color photography, exposure, development, fixing, intensifying, reducing, varnishing and retouching, wet collodion, all printing processes, mountants and mounting, lantern slides and the lantern, and photomechanical processes. A glossary of 60 pages finishes the book, of which we have not exhausted the list of contents.

The Chestnut Tree
Mary C. Cottam

The Photo-Miniature
A Magazine of Photographic Information
EDITED BY JOHN A. TENNANT
AND THOMAS BEDDING, F. R. P. S.

Volume VIII AUGUST, 1908 Number 92

Practical Orthochromatics

Orthochromatic photography is a method of taking photographs in correct light and shade. In this definition there are three terms which we must understand before the definition, as a whole, is clear. (1) Photography is a process of drawing by light, which, passing through a lens, impresses an ordinary plate with an image of the view or object in front of it. On development we get a negative, in which the lights and shades of the original subject are reversed, and from this negative we make a print. The lights and shades in this print are either absolutely or relatively false as reproducing the visual luminosities in the subject. (2) Suppose that we have photographed a country scene The blue sky is flecked with white clouds; dark green trees overhang a red-roofed house, and orange-colored flowers dot a field of light green grass. (3) In the print the sky will be white; there will be no clouds; the trees and grass will be of a uniform tint and the orange-colored flowers will be dark. The lights and shades (or color luminosities) of the scene will be incorrectly rendered in the photograph. The object of orthochromatic photography is to translate the blue, white, dark green, red, light green and orange colors of our country scene into proportionately light or dark tones or values in the photograph. In other words, each "color value" in the scene should be represented by a correspondingly light or dark tone in the monochrome scale of the print. Most photographs, then, being either absolutely or relatively

faulty in respect of color values as the eye perceives them, we must find out why this is so before we can understand the advantages which orthochromatic photography offers to the practical worker.

Light

One of the essential agencies in the making of a photograph is light. What is light? If we expose a sensitive plate in total darkness and pass it through a developing solution, we shall not get a negative or any metallic deposit at all, because no light action took place in the film, and consequently, there was no exposed silver to develop. Even in darkness, however, our country scene has not changed in substance: It is all there, and the one thing needed to make it visible to the eye is light, which proceeds from the sun, the principal source of natural light, and, therefore, as we shall see, of color. The objects of creation are not of themselves colored; they derive their colors from an external source, and that source is the sun. It is clear, too, that the light of the sun is of a compound nature, otherwise everything around us would be uniform in tone or color.

Analysis of Light

A "ray" of light is a common figure of expression not always understood by those who use it. Light, in its rudimentary aspect, is said to consist of an infinite number of rays moving in straight lines from the sun to the earth. What is true of one ray is therefore true of all. By analyzing or splitting up a "bundle" or number of those rays we get a fundamental idea of the nature of light. In other words we decompose it and see what it is made of. To decompose light it must be refracted, or bent out of its original course, by a suitable medium which will dissect it and expose to the sight. Two simple experiments enable us to do this. Into a darkened room let a "beam" of light—another convertible term for "rays" or "bundles" of rays—fall through a small opening upon a plain piece of white cardboard. The patch of light on the card will, of course, be white. Now in the path of this beam of light place a prism and note what takes place. The white light has changed into a band of color: Violet, blue, green, yellow, orange and red, each color blending imperceptibly into

the other, proving that what, for convenience sake, we call white light is really made up of several kinds of colored light. The experiment can be carried a step further and the band of colored light re-composed by a second prism, placed in the axis of the first, into white light. Both experiments are easy to make, and should not be taken for granted, as a knowledge of the nature of light is the key to success in all branches of orthochromatic photography.

Color

It is white light that illuminates our country scene; nevertheless, individual objects in that scene take different colors. There is the red of the roof, the blue of the sky, the green of the grass. Why is this? Because every object in nature is affected by a different part of the solar spectrum as our band of colors is called. It absorbs some part of the light and reflects others. For example, white light is primarily a mixture of the red, green and blue parts of the spectrum; subtract the blue, the red and green left will produce yellow. The cottage roof in our country scene is red because it absorbs the blue and green parts of the light to form red, while it reflects or does not absorb the red. The sky is blue because it absorbs the red and green, and reflects the blue. Colored objects as we see them in nature are saturated in white light; this in the photograph heightens the transparency of the shadows when ordinary plates are used. Pure color, then, it will be understood is not seen in nature. What we see are a number of compromises due to the phenomena of absorption and reflection. Nevertheless, it is *what* we see that we are concerned with in photography—with the eye-values of our subjects rather than with color as such. In orthochromatics we do not photograph the *quality* of the colors, but their quantity, a distinction and a difference as we shall show in the course of this monograph.

Color Sensation

Now, in writing of color, we must bear in mind that it is merely a physiological sensation: something seen, rather than a thing which we can handle, weigh or dispose of like any other body. Why and how do we see color? Because at the back of the eye there is a sensitive sur-

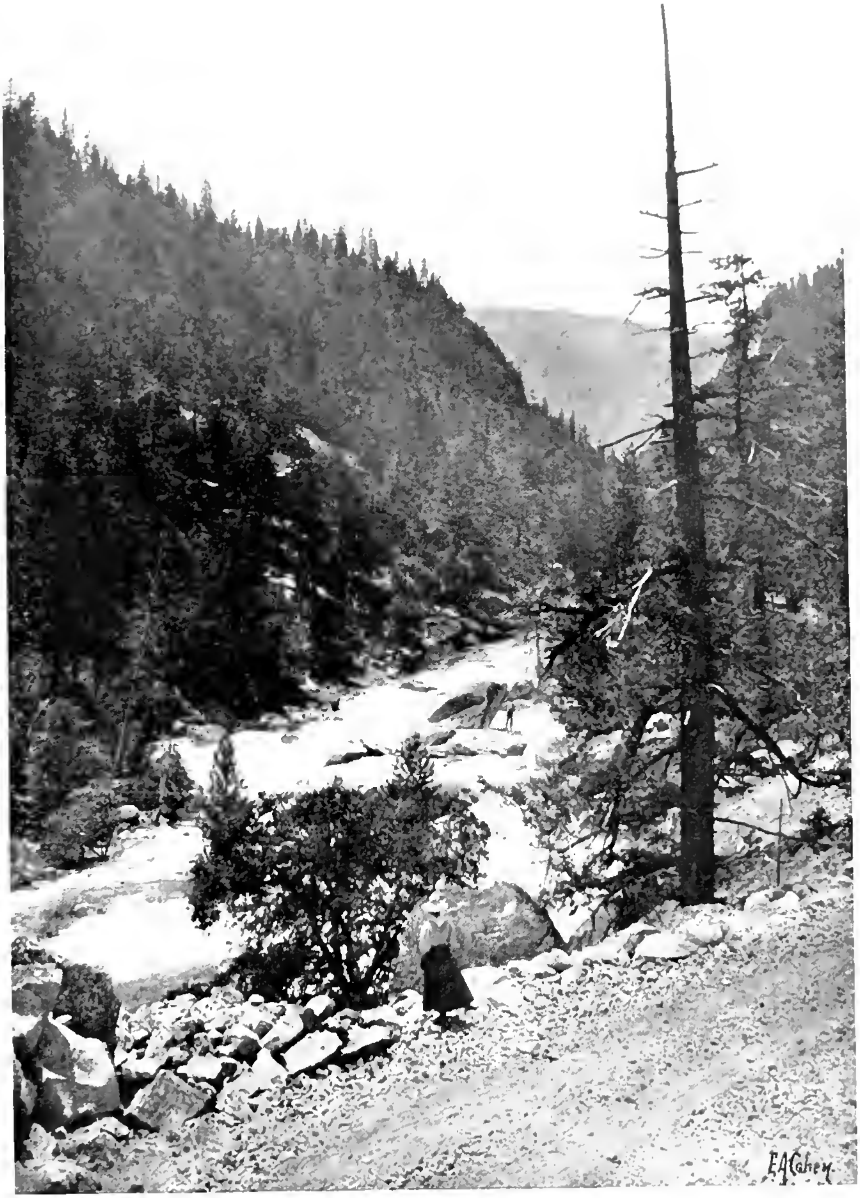
face called the retina, to which the lens of the eye passes images of external objects. This retina is composed of a great number of nerves or fibrils, each of which has its own color-sensitiveness. Some of them are affected by violet, others by blue, green, red, yellow. Sensations of color are stimulated in the brain by these fibrils, and the whole process of seeing and differentiating the colors of nature is carried out by the eye, the retina, the optic nerve and the brain, working in unison.

The Wave Theory

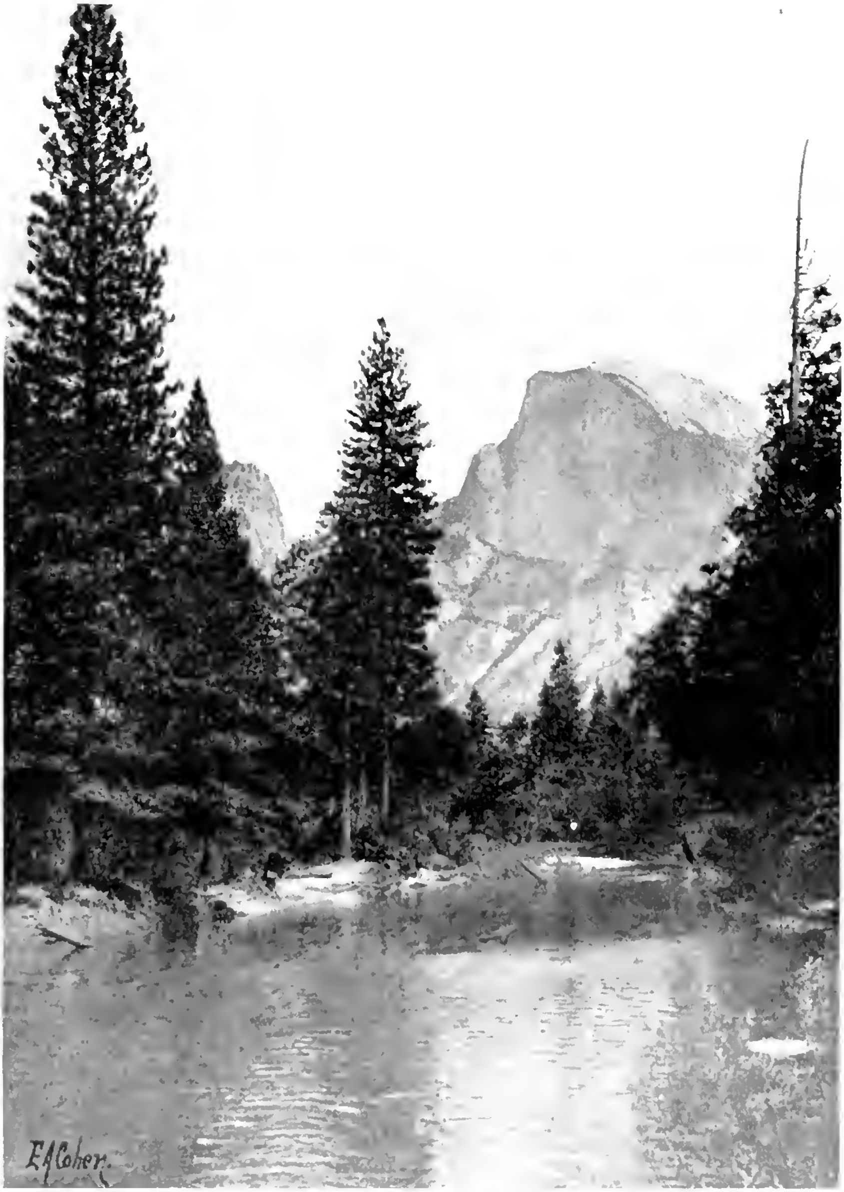
These color sensations are excited by the sun. We have written of "rays," "beams" and "bundles" of light: they are merely elementary terms of convenience. So is the word "color." Light is simply a series of vibrations in space, perceptible to the brain through the eye; just as sound vibrations are perceptible to the brain through the ear. When we touch the key of a piano, the sound we hear is caused by the vibrations of the wires in the body of the instrument. These vibrations (or sound waves) strike the aural nerves, through the ears, which carry the sounds to the brain. Something like that happens with light. The ether which fills all space vibrates under the sun's radiations, and the "colors" which we see are caused by the differences in the magnitudes and frequencies of those vibrations, or wave-lengths, as they are called. The wave-lengths which cause the red and orange sensations are longer than those which cause the blue and violet. The longer the wave-length the less frequent the vibration that produces it; the shorter the wave-length, the more frequent the vibration. The red end of the spectrum is the region of the shorter wave-length; the violet end that of the longer.

Fraunhofer Lines

The orthochromatic photographer need not concern himself about the minute measurements of these wave-lengths. There is another and simpler way in which he can identify and locate particular parts of the spectrum. When light is carefully examined through a spectroscope the band of color is seen to be crossed by numerous fine dark perpendicular lines called "Fraunhofer lines" after their discoverer. Fraunhofer gave the more prominent of these lines significance as points of reference by

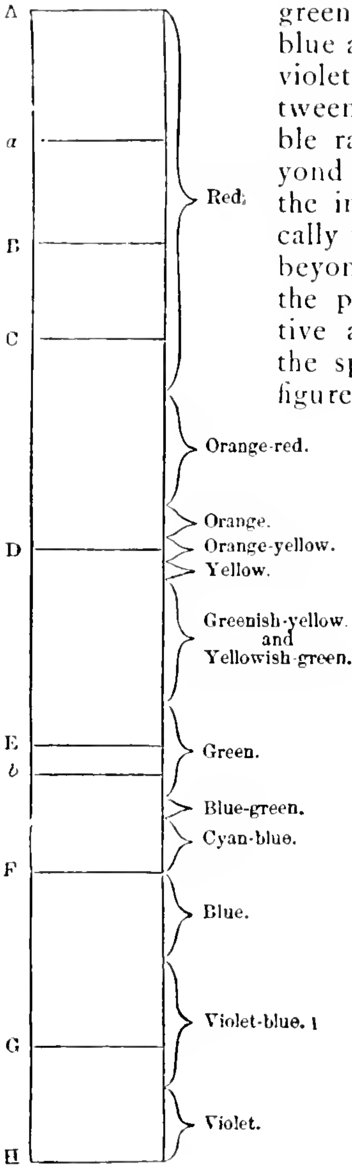


A Yosemite Trout Stream
Edgar A. Cohen



Half Dome from River Road: Yosemite
Edgar A. Cohen

attaching to them the letters of the alphabet. Thus the line at the end of the visible red is A; B indicates the bright red, C the orange-red, D the bright orange-yellow, E the yellow-green, F the green-blue, G the full or indigo-blue and H the limit of the visible violet. The visible spectrum lies between A and H. There are invisible rays at each end, however, beyond the lines A and H; of these the infra-red beyond A are chemically inactive, while the ultra-violet beyond H are extremely active on the photographic plate. The relative activities of various parts of the spectrum can be expressed by figures, which show the comparative photographic effects of the different colors on the sensitive film.



Prismatic Spectrum

Eye-values and Chemical Values

For example: Yellow, which is the most brilliant color seen by the eye, has far less photographic action on the film than indigo, which lies in the invisible end of the spectrum and is practically unseen by the eye. Consequently, the eye-values and the photographic values of the colors that are seen in nature are not in accord. The differences are made clear in the following table. Let the maximum eye-value and photographic value of yellow and indigo be put down as 1,000. The relative activities of the other colors

will be represented by diminishing numbers at both ends of the spectrum:

	Lines	Luminous intensities	Chemical Intensities on Silver Bromide
Dark red	A	Just perceptible	0
Red	B	32	5
Bright red	C	94	10
Orange	D	640	50
Yellow	D-E	1,000	100
Green	E	480	200
Blue	F	170	500
Indigo	G	31	1,000
Violet	H	6	650
Ultra-violet	H	0	450

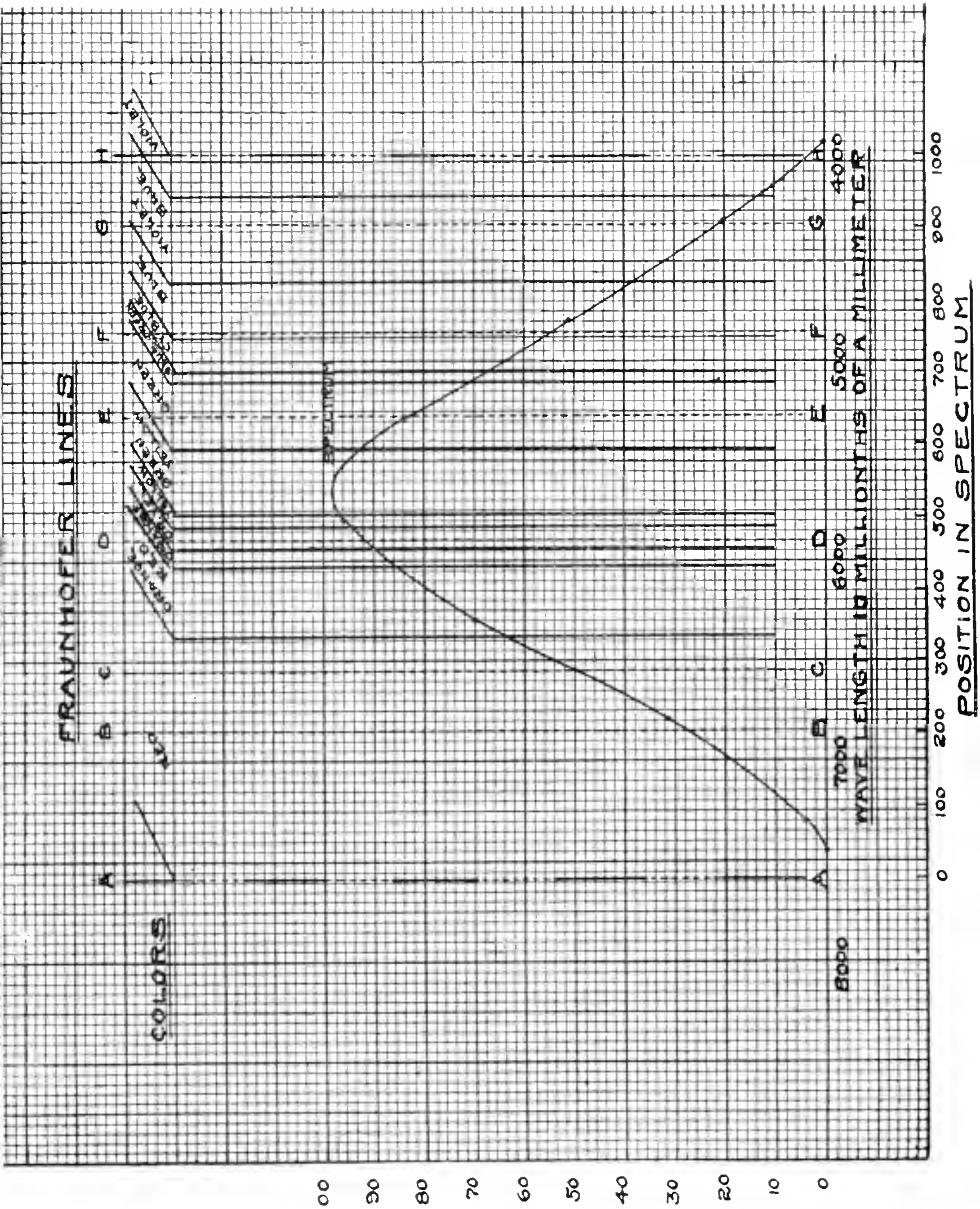
The high points are indigo and yellow. From column one, yellow should be about thirty times more sensitive than indigo. In column two, it is found one-tenth as sensitive, that is, the ratio is about three hundred times reversed. The problem of orthochromatic photography is to represent the luminosities, as shown in Column I, by proportionate chemical intensities, which, Column II tells us, ordinary plates signally fail to do. Diagram I shows the visual luminosity of the normal spectrum of diffused daylight. This diagram may serve as a standard for comparing the selective color sensitiveness of various ortho plates by plotting their color sensitive curve alongside the visual curve here given.

Why Ordinary Plates Fail

This is because they are so unequally sensitive to the different parts of the spectrum, being mostly affected by the violet and blue rays, less so by the green and yellow, and least of all by the red. Yellow and orange affect them so slightly that objects in those comparatively brilliant colors are unnaturally dark in the photograph; on the other hand violet and blue act so strongly on the silver salts that an excessive reduction of them takes place, and blue objects appear white in the print. The ordinary plate is "color-blind."

The Problem

The task of the maker of orthochromatic plates, then, is to sensitize his plates to the different colors of the spectrum in direct proportion to their luminosities (or eye-



Visual Luminosity of Normal Spectrum of
Diffused Daylight (Wallace)

values). In other words the activities of the blue-violet end of the spectrum must be depressed or cut down; whilst the yellow-green rays must be allowed to exert more powerful action on the plate.

Early Steps

The late Dr. H. W. Vogel first defined the principles of orthochromatics. He found that by staining a film of collodio-bromide of silver with a yellow dye he got a truer rendering of the yellow part of the spectrum than that given by the undyed film. The dye acted by selectively absorbing the yellow-green rays, thus increasing the sensitiveness of the film to those rays. This discovery formed the starting point of valuable experiments by Abney, Carey Lea, Waterhouse, Eder, Ives and others, which are the bases of present-day work with sensitizing dyes. In 1884, the first eosin-bathed gelatine dry-plate was commercially introduced; today the practice of orthochromatic photography is general.

Action of Dyes

It is not clear whether the dye forms a definite chemical compound with the silver or not. Some experimentalists assume that it does. Eosin, an early sensitizer for the yellow rays is thought to form an eoside of silver; two other sensitizers—erythrosin and cyanine—are supposed to form similar combinations. The theory is that on exposure the dye transfers the light vibrations to the silver bromide, decomposing it and forming products which partly reduce the silver. Whatever the chemical action, the photographic effect of the dyes is unmistakable. Solutions of them absorb different parts of the spectrum light. Erythrosin, for instance, absorbs the yellow and yellow-green about D–E; plates stained with this dye are, therefore, made more sensitive to yellow—the dye sensitizing it to the color which it (the dye) absorbs. The ideal plate should be sensitive throughout the whole of the spectrum in direct ratio to its visual brightness: that is, sensitive to light values, or luminosities, without regard to color or hue.

Sensitizing Formulæ

Numerous dyes have been used for orthochromatizing plates during the past thirty-five years. Most of them are derived from the by-products of coal in the preparation

of house gas, and are known as hydro-carbon compounds. Eosin ($C_{20}H_8Br_4O_5$) is a type of these bodies, which are complex in character, needing special study, which the orthochromatic photographer probably cannot give. In the formula for eosin, the capital letters stand for the elements, carbon, hydrogen, bromine and oxygen, of which the dye is formed; the figures roughly express the number of molecules of each element in the compound. This is all the theoretical chemistry the reader need trouble about. Eosin is used to sensitize a plate for the yellow and green rays; erythrosin, however, is preferred by some on account of its alleged greater reliability. For sensitizing to red, cyanine is generally advised and used. The following sensitizing formulæ are quoted from Payne's book on *Practical Orthochromatic Photography*. In the Schumann formula, the plates are first bathed in a 1 per cent solution of ammonia; Miethe's formula is used without a preliminary bath.

Erythrosin Formulæ

	Distilled water	10 per cent ammonia solution	Erythrosin solution 1:1000
E. Vogel	15.0	2.0	5.0
Mallmann	17.5	4.0	2.5
Bothamley	16.0	2.0	2.0
Miethe	15.0	1.5	2.0

Cyanine, Erythrosin and Eosin Formulæ

	Schumann	E. Vogel	Miethe
Water distilled	200	150	200
Alcohol 90 per cent	10	20	50
Ammonia, 10 per cent solution	40	20	27
Cyanine, alcoholic solution 1:1000	20	4	2
Erythrosin, alcoholic solution 1:1000	. .	. .	25
Eosin	. .	30	. .

Ortho-chrom T

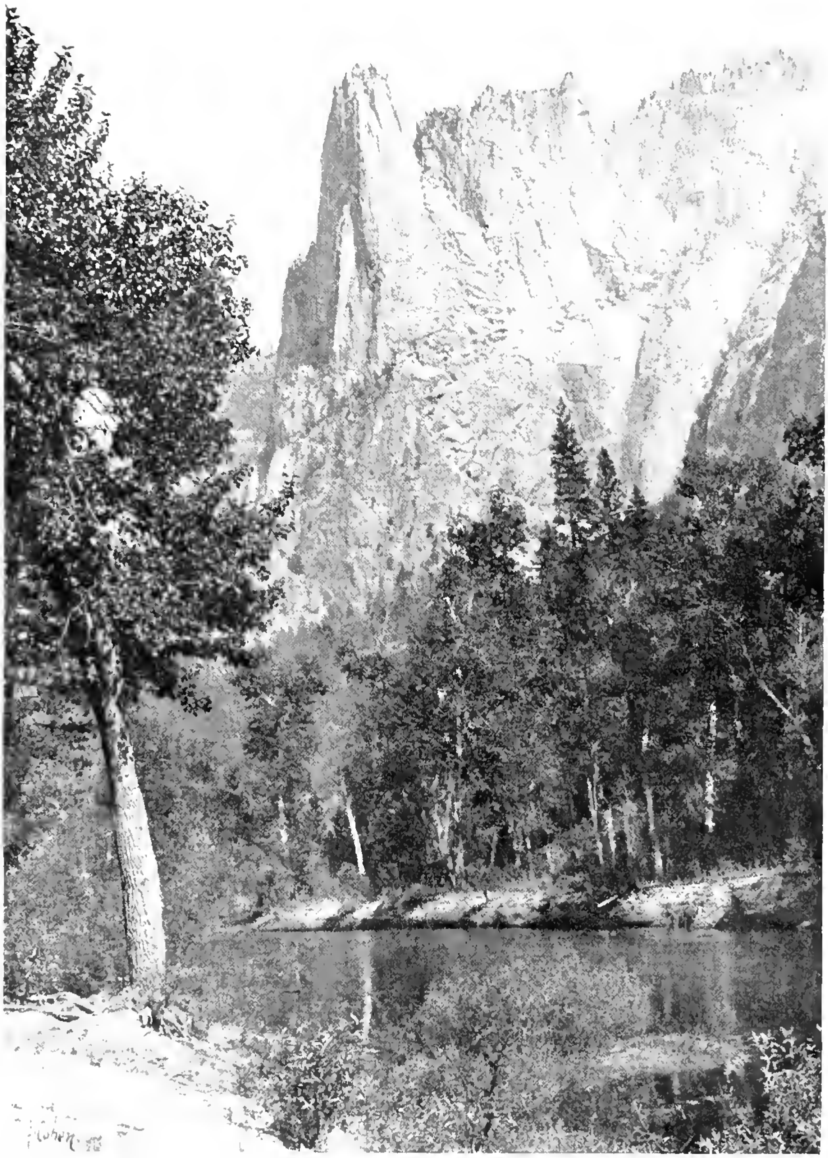
Two sensitizers recently introduced are said to have great advantages. Orthochrom T gives plates an even color sensitiveness through the whole of the spectrum into the red; it also increases their normal speed without impairing their clean working qualities. On account of this extreme sensitiveness, the plates must be manipulated in the dark from the moment they are placed in the dyeing bath until they are finally fixed. The dye is prepared as follows: A stock solution of one part of Orthochrom T in 1,000 parts of 90 per cent alcohol is made and stored in the dark. This solution is said to keep indefinitely. The dyeing solution is made up in the following proportions: Distilled water, 200 parts; strong ammonia (.880) 3 parts; Orthochrom T (1:1000) 4 parts. Filter the bath; use it at a temperature of from 60° to 65° Fahr., and bathe the plates in it for two minutes.

Homocol

Homocol is also said to give even sensitiveness. It is made up in 1:1000 alcoholic solution. For the dyeing solution: To 20 ounces of water add 135 minims of the alcoholic solution of Homocol, and then add 185 minims of strong ammonia (.880). This should be made up immediately before use. A plate of medium rapidity is advised for bathing, as Homocol slightly increases the general sensitiveness. About one ounce of dye solution suffices for thirty square inches of surface. With a four to six times yellow filter, made by staining gelatine-coated glass with 1:200 solution of naphthol yellow, Homocol-bathed plates are said to be very sensitive to green and yellow.

Bathing the Plate

The ammonia in the dyeing solution probably oxidizes the silver salt, which thus more readily combines with the dye. The use of ammonia with very sensitive plates is risky, as they are liable to fog under its action. For bathing purposes, either in plain, alcoholic or ammonia solution of dyes, medium rapidity plates are best; they are less liable to fog, and the general increase of sensitiveness which the dye gives will not make them too quick for all-round purposes. The work of bathing the plates



Sentinel Rock and River: Yosemite
Edgar A. Cohen

Forest Patrolmen at Breakfast: Merced Big Trees, California
Edgar A. Cohen

should be done in the dark room, and with a deep ruby light, to which the plates should be exposed as little as possible. Have the dye solution ready in a graduate, then unpack the plates, carefully dust them, and lay them film sides up, in a clean dish. It is a good plan to place the plates at one end of the dish, leaving the other end clear. Tilt the dish, clear side up, and pour the solution into it with an even sweep, then tilt the dish back, so that the solution flows evenly over the plates without forming air-bells. Rock the dish gently to and fro for five minutes, then remove the plates, one by one, and wash in a stream of running water for three or four minutes to remove the excess of dye. Fit the water-tap with a filter—ordinary flannel tied over it will do—so as to intercept any solid particles that are in the water. When the dyed plate has been washed, swab the surface of the film with a clean wad of moistened absorbent cotton. The plates should be allowed to dry spontaneously in a perfectly dark room that is dry and dustless. Stand them on strips of clean blotting-paper, film sides to the wall, and if the bathing has been done in the evening the plates will generally be quite dry in the morning. Some authorities recommend a preliminary soaking of the film in plain water before applying the dye solution, this is not necessary. Others omit the washing after bathing. Plates from which the excess of dye has been removed by washing keep longer than unwashed plates. Neither kind, however, keeps indefinitely, and therefore the plates should be used as soon as possible after they have been dyed and dried.

Purchasing Dyes

The dyes named in the foregoing captions, or any other dye referred to in this monograph, can be obtained of Pickard & Kutroff, 98 Liberty street, New York; Eimer & Amend, Third avenue, New York; Berlin Aniline Company, Water street, New York; Henry Heil Chemical Company, St. Louis; Sargent & Company, Chicago; Fuerst Brothers, London. As the dyes are used in such minute quantities, the photographer will not need to purchase more than a few grams of them at a time for bathing purposes. Usually the local dealer can obtain supplies to order.

Light-filters

We have seen that, by bathing a plate with a suitable dye, it is made more sensitive to green and yellow light; but the blue-violet rays will still be too active on the plate unless something is done to reduce that activity. This is accomplished by placing between the object photogaphed and the plate some medium which depresses, or cuts out, a part of the blue-violet light without affecting the other colors. Such a medium is called a color-screen, or light-filter. Its use in orthochromatic photography is more important than is generally appreciated. The filter must be of such a color that it will absorb blue and violet light, and the color which does this is yellow. Properly the absorption properties of a light-filter should bear a definite relationship to the sensitiveness of the plate. This being known, the choice of a suitably colored filter standardizes the factors of plate-sensitiveness and filter-absorption, and deprives orthochromatic work of some of its uncertainty. The principal plate-makers, nowadays, either supply light-filters adjusted to their plates or indicate the kind of filter best suited to them and for particular kinds of work.

Position of Filter

The filter may be placed either (1) in the front of the lens, (2) in the stop opening, (3) at the back of the lens in the camera, or (4) immediately in front of the plate or film. We have found all four methods equally effective. The best position is either in front of the lens or plate, and of these, the first-named is generally advised as the more convenient. No. 3 is apt to distort the image, unless the focusing is done through the filter; if this is not done, the image will be thrown back by a distance equal to about the thickness of the filter, and its definition consequently degraded.

Making a Filter

Home-made filters are of various kinds. A piece of gelatine dyed to the proper color can be placed at position No. 2, the stop-opening of the lens; or the diaphragm itself can be covered with the colored gelatine. The method is available only with lenses fitted with Waterhouse diaphragms. Stained gelatine on glass is the commonest form of home-made filter; it can be fitted in a rectangu-

lar frame or holder and attached to the lens board in non-folding cameras. McIntosh describes the following method of preparing such a filter: Cut clear white gelatine into convenient sizes and stain it to the required depth of color, then rinse in cold water to get rid of any excess of dye on the surface. With filter Yellow K a solution of 1:250 is suitable for deep filters, 1:500 for medium filters, and 1:1000 for light filters. Filter Yellow K has an absorption curve which shows it to be very suitable for staining light-filters, and it gives satisfactory results on tests for permanence. When the gelatine is sufficiently rinsed, a square of celluloid larger than the filter is to be, but smaller than the gelatine, is slipped under the latter, and the two are laid upon a sheet of cardboard, the edges of the gelatine being smoothed out. Pass a glass rod over the surface to remove the surplus water. The edges of the gelatine will quickly adhere to the card, while the underlying celluloid will prevent the celluloid from doing so. When dry, cut the gelatine away from the card—the celluloid is readily stripped—and it will be found to lie flat, which is, of course, essential.

Mounting the Filter

If the gelatine has surface markings, they will disappear when it is mounted with Canada balsam between two pieces of glass. To cement, cut the gelatine a quarter of an inch longer than the glasses, and allow it to project to that extent at one side, when placing it between them. A piece of stout paper folded double should then be pasted on the inner side, and, the end of the gelatine being clipped in the center of the fold, the edges are lapped over the glass to form a hinge. When the hinge is dry, open the glasses like the leaves of a book and pour the Canada balsam slowly into the joints. Use sufficient of the balsam, so that when the glasses are pressed together it will spread uniformly and exude at the edges. One or two clips should be used to press the glasses together while the balsam is being dried by gentle heat. When the balsam is hard, the filter can be cleaned and bound around the edges like a lantern slide. Very fluid balsam is the easier to use, but a thicker kind dries quicker and is less likely to allow the glasses to spring apart.

Gray's Method A simpler method of making a filter is recommended by Gray. The dye is auramine, the light yellow variety of which does not fade. To make the filter, immerse a fixed and washed lantern plate for a few minutes in a saturated solution of the dye (previously prepared with hot water to facilitate solution). If the plate, when dry, shows opalescence, it can be removed by immersing it in a solution of one part acetic acid and twenty-five parts water. To finish off the filter, protect it by a cover-glass and bind round the edges. Solutions of the following dyes can also be used for staining the fixed lantern plate: Fast red, fuchsine, aurantia, aurine, brilliant yellow, picric acid and its salts, naphthol yellow, tartrazin, malachite green, acid green, naphthol green, methylene blue, methyl blue, methyl violet. Liquid screens to fit on the front of the lens can be made by using solution of bichromate of potash, of varying strength according to the depth of color desired, in a circular glass cell of the well-known ray filter form.

Measuring Filters The filter made, the photographer will wish to know how many times it increases the exposure. The simplest way of finding this out, is to take photographs both with and without the filter, and compare the results. Copy a gray platinum print in the camera, first with the filter, then without. Develop and fix the plates simultaneously and examine them. Repeat the experiment until the densities of the negatives are about equal, and then work out the relationship which the exposure of the filtered plate bears to that of the unfiltered. The answer will be the X times of the filter. Measurements should be made for indoor and outdoor work, and for the artificial lights that are used.

Commercial Color Filters The home preparation of color filters is, however, a tedious and messy operation, involving much knowledge and more time and care than the average worker can spare. Hence the reader will doubtless welcome a brief review of the various screens and color filters commercially available here and abroad. With the steadily increasing interest in orthochromatics, there is now a wide field

for choice among these commercial filters, and they offer at once the simplest and most satisfactory solution of the filter problem.

First and foremost, let us not forget that here we are dependent upon the makers' claims and, alas! the glowing terms of the descriptive catalogue will, at times, outshine practical performance. But it is not hard to read between the lines if we think as we read.

Contrast and Compensation Filters

Broadly speaking, all color filters may be divided into two classes: (1) *Contrast Filters* which simply depress or cut out the excessive activity of the blue and blue-violet rays thus giving the green, yellow and red rays more time to impress the plate. (2) *Compensation Filters*, which are, in some measure, selective in their absorption of different spectral rays, and tend to correct the differences between the luminosity value and actinic value (or chemical intensity) of the different spectral rays.

The majority of the "color screens," ray filters or color filters sold at moderate prices for use in general orthochromatic work belong to the first class, and are *contrast* filters. *Compensation* filters, on the other hand, are intended for finer and more exact work, where certain colors are to be "picked out," as it were, or where it is desired to adjust filter and plate for a definite purpose. Filters of this class are usually made of the best possible material and adjusted with special care, so that they are higher in price than the ordinary contrast filter.

Kinds of Filters

Commercial filters vary largely in form and construction and it is not always possible to identify their make-up. Generally speaking, however, they are either: (1) One or more thicknesses of colored glass, either as supplied by the glass maker in various degrees of finish or optically ground and polished. (2) Single or compound films of dyed gelatine or collodion, mounted in optical contact with Canada balsam between two thin glass plates, which latter may be simply "ground" or optically worked with the same fineness and precision as the surfaces of a lens. (3) Glass cells, consisting of two pieces of optically plane or worked glass enclosing a

glass ring in which a colored liquid or dye is sealed and which may be changed according to the requirements of special work. It is obvious that among these kinds there is abundant room for different grades of material and workmanship, which explains the varying prices attached to the many varieties of commercial filters.

Ingento

The Ingento color filter (Burke & James, Chicago) is an inexpensive filter of the *compensation* class, designed by the noted physicist, R. James Wallace, and said to be an exact duplicate of his "visual luminosity" filter. It is offered for use with all brands of color-sensitive plates and for all kinds of subjects under normal conditions. This indicates a filter for general use where the luminosity contrasts in the subject are not extreme. Used with the Cramer Iso plate the Ingento filter completely cuts out the ultra-violet rays, depresses the activity of the blue and bluish-green rays, and permits the maximum action of the yellow and green rays—thus approximating the ideal visual luminosity curve. In form it consists of a yellow (spectroscopically measured) film cemented between two discs of optical crown glass, ground and polished, mounted in a metal cap fitting over the hood of the lens. In use it increases the normal exposure six times.

Isochrom

This, by the same makers, is similar in form to the Ingento, but apparently belongs to the *contrast* class, as it eliminates the ultra-violet, violet-blue and bluish green rays by absorption, permitting only the yellowish green and bright yellow rays to pass to the plate. It is offered for use, with all brands of orthochromatic plates, for subjects such as cloud records, paintings, distant views, open seascapes and commercial work—in short, wherever it is desirable to slightly emphasize the "color values" of the subject.

Ideal

A cheaper color screen, by the same makers, intended for popular use with hand-cameras, increasing the normal exposure three times only. The best results with this filter follow full exposure and ample development.

Chromatic Compensator

A light yellow filter (M. A. Seed Dry Plate Company, St. Louis), calculated, I believe, by R. James Wallace and adjusted for use with Seed's ortho plates, more especially with the Seed L. Ortho plate. With this plate it gives moderate luminosity correction, the blue and violet rays being depressed and the yellows, greens and blue-greens being rendered approximately in true values. Its action does not extend beyond the yellow-greens, which indicates its use for landscapes, some flower subjects, seascapes, pictorial work and the like. It increases the normal exposure four times, and so may be used on hand-cameras for many subjects. Focusing is done through the filter.

Chromatic Curve Corrector

This, also adjusted for Seed plates, is deeper in color than the *Compensator* and increases the normal exposure 15 times. The activity of the violet and blue rays is almost completely depressed, the maximum action being allowed to the yellow, orange and red rays. With this filter the luminosity values of the subject, even where extreme, are faithfully given. Focusing should be done with the filter in position and an ample exposure given to the plate.

Bichromate Ray Filter

The bichromate of potash ray filter (Bausch & Lomb Optical Company, Rochester, N. Y.) belongs to the class of liquid filters largely used in scientific and laboratory work. It consists of two optically plane glass plates and a glass ring with a large opening. This ring is placed between the two plates, adhering closely by means of vaseline, thus forming a glass cell, the whole being fixed in a metal mount which fits like a cap on the hood of the lens. The dye or colored fluid, usually a 1, 2, or 3 per cent solution of potassium bichromate, is poured into the glass cell and the opening sealed with a soft rubber plug held in place by a metal spring. This is, properly speaking, a contrast filter and acts by cutting out the ultra-violet and violet-blue rays, thus permitting the yellow, green and orange-red rays to do their work on the sensitive plate. The advantage of the liquid cell-filter is its adaptability where filters of varying depth or

The Principal Color-Sensitive Plates of America and Great Britain with Some Particulars of their Purpose, Make-up and Use

Maker	Name of plate	Color sensitiveness unscreened (without a filter)	Approximate speed of plate without a filter	Adjusted screen or filter advised	Increase of normal exposure with a filter	Uses: Remarks
Seed	L. Ortho	Yellow and green	Same as Seed 26X	Seed's Compensator	4 times	For landscapes and subjects without extreme contrasts.
				Chromatic Curve Corrector	15 times	For subjects without red; where absolute color values are desired; or possessing decided luminosity contrasts.
Seed	Commercial ortho.	Ditto	30% slower than Seed 26X	As above	....	For commercial work use Compensator or Chromatic Curve Corrector according to degree of correction desired or range of contrasts in subject.
Seed	Panchromatic	Red, orange, yel., green to blue	Same as Seed 26X	....	....	For three-color and fine reproduction work.
Stanley	Commercial	Yellow and green	4 times slower than Standard Extra Rapid	Any good yellow screen (Ingento)	Depends on screen used	For furniture and similar commercial work where reds are not dominant.
Stanley	Polychrome	Ditto	Quicker than Stan'd Ex. Rd.	Ditto	Ditto	For all general purposes; rapid work with light screen.
Standard	Orthonon	Ditto	Same as regular Standard	Ditto	Ditto	A non-halation plate for landscape, general outdoor and commercial work, interiors, etc.
Hammer	Ortho Ex. Fast Slow, Double-Coated and Commercial	Orange, yellow, green and orange-reds	....	B. & L. Ray Filter	6 to 8 times varying with screen used	Non-halation for interiors and contrasty subjects.
				Ingento, etc.		Commercial for industrial purposes with Ingento.
Cramer	Inst. Iso. Medium Iso.	Orange, yellow, yel.-green, blue-green and blue	Same as Cramer Crown. 50% slower	Ingento or Ideal	Ing'to 8 times Ideal 3 times	Inst. Iso or very rapid exposures. For landscape and outdoor work, portraiture, interiors, flashlight,
Cramer	Slow Iso	Orange, yellow, yellowish green	8 times slower than Crown	No screen advised or needed	....	Copying paintings, woodwork, fabrics, clouds, etc.
Cramer	Isonon	Yellow-green	Same as Crown	Isochrom	8–10 times	For portraiture and commercial purposes. Heavily coated; has considerable latitude in exposure.
Cramer	Commercial	Orange, yellow, green	Slow	Ingento or Isochrom	10–15 times	For subjects requiring vigor and contrast.
Cramer	Trichromatic Panchromatic	Red to blue	....	Red	....	For three-color work and subjects with contrasts of red and black. Extremely sensitive to red.

		green	than Kingplate		filter	work.
Defender	Slow Ortho	Ditto	6 times slower than Inst. Ortho	....	....	Commercial work, woods, paintings, machinery, etc. These two Defender plates are practically the Carbutt Ortho Sens 27 and Sens 23 respectively.
Lumière	Ortho A	Yellow and green	Same as Lumière Blue Label	B. & J. Ideal or Goerz Ray Filter	5 times 10 times	General outdoor work.
Lumière	Ortho B	Yellow and red	Ditto	B. & J. Ingento	6 times	Flower photography, fabrics, subjects with red.
Lumière	Panchro C	Green, yellow, red	Ditto	Goerz	8 to 15 times	Copying paintings, spectrum and scientific work.
Elliott	Barnet Ortho Extra Rapid	Yellow-green	200 H. & D.	Barnet Ortho screen	4 to 6 times according to depth of screen	For general purposes, the medium plate being adapted for copying and similar subjects. The Extra-Rapid for portraiture, flashlight work, etc.
Elliott	Barnet Ortho Medium	Ditto	100 H. & D.			
Imperial	Orthochrome	Yellow, green, blue	300 H. & D.	Imperial Ortho screen	Ditto	Landscape, clouds, flowers, heavy foliage, etc.
Imperial	Non-Filter	Yellow, green	200 H. & D.	No screen needed	....	The filter is embodied in the sensitive film.
Kodak	N. C. Film	Yellow, green	....	No information but a light yellow screen will give better "color values"	....	The color sensitiveness in roll-films of all makes is designed so as to give a better general rendering of the range of luminosity contrasts, detail in green shadows, etc. Where sufficient exposure is given, the ortho films now everywhere available give better average negatives than those formerly sold—this being due to their added color sensitiveness.
Kodak	Film pack					
Ansco	Ansco Film					
Edwards	Ensign Film					
Elliott	Barnet Film					
Wellington	Iso Speedy	Yellow, green	Slightly slower than "Speedy"	Wellington screen	5 times	For general work. Full exposure and ample development advised, with a "safe light" in the dark-room lantern.
Wratten	Verichrome	Red, yellow, green	100 H. & D.	Wratten screens: see the makers special instructions	According to screen and plate	For general work. Insensitive to red and can be handled in an ordinary dark-room light.
Wratten	Allochrome	Green and yellow				
Wratten	Pinacyanol	Red, green, yellow				Pinacyanol is a bathed plate.
Wratten	Panchromatic	All colors except blue and violet	60 H. & D.			All the Wratten plates except Allochrome must be handled carefully in a "safe light." See booklet.

No definite information available regarding Mawson & Swan's Ortho Plates; Ilford Chromatic and Isochrom; **Marion Iso**; Warwick Rainbow. In all instances it is advised to get the special booklets issued by the makers of color-sensitive plates for general information.

intensity are desirable. Its actual efficiency, of course, depends on the adjustment of the filter to the plate and luminosity contrasts of the subject. Thus, for copying faded documents and old masters with a slow Iso plate, a 5 to 10 per cent bichromate solution may be required; for spring and summer landscapes, a 1 per cent solution; while for autumn foliage, some flowers and sunset work, a solution 1 to 250 may do all we require. For hand-camera work, for use on lenses fitted with shutters having pumps on their face, a special adapter is made permitting the use of this form of filter.

Imperial Orthochrome This, as its name implies, is made and adjusted for use with Imperial Orthochrome plates (G. Gennert, New York). It consists of colored glass discs in metal frames fitting on the hood of the lens, and is offered in three densities for different uses, viz., increasing the normal exposure respectively 2, 4, and 8 times,—the 2-times filter being advised for general hand-camera work and the 8-times filter for time exposures and subjects having strong luminosity contrasts. A series of higher grade filters is offered for use with anastigmat lenses.

Burchett Screens These screens (Dallmeyer Ltd., London), are much favored by European pictorial workers. They are made in three series. I. A light screen consisting of two dyed films combined between two plain optical glass discs, increasing the normal exposure one and one-half to two times. II. Consisting of an optically worked disc of light olive-green combined with a very light amber-colored disc, increasing the exposure two and one-half to three times. III. Similar to No. II, but with a much darker green disc, increasing the exposure six times. It is advised to use these screens behind the lens, focusing with the screen in position. Carpenter and Luitweiler (THE PHOTO-MINIATURE NO. 24) find these screens peculiarly adapted for sea and cloud views.

Filter Yellow K Under this name, Wratten and Wainwright (Croydon, Eng.), have introduced a very useful series of three light filters for use with their ortho plates. Filter K I is a very light screen for use with yellow-green sensitized plates,

increasing the exposure one and one-half times. K II is the most generally useful screen of the series, slightly deeper in color than K I, and increasing the exposure three times. K III gives absolute color rendering through the entire range of the spectrum and increases the exposure five times. This firm also offers a series of red, green and blue screens for tri-color and special subjects. Their booklet "Real Orthochromatism," should be seen by all who use their ortho plates, screens and plates being carefully adjusted for combined use.

Ilford Screens These are made in two series, A and B, and two tints (Ilford Ltd., London), apparently of colored optical glass. No. 1 increases the exposure three times and is advised for general hand-camera and outdoor work. No. 2 is deeper in color, for copying and subjects of extreme luminosity contrasts, increasing the exposure six times.

Wellington Filter This is made for use with the Wellington (Elstree, Eng.) Iso-Speedy and Ortho plates and increases the exposure five times. No data are available as to its make-up, but it is apparently adjusted for use with yellow and green sensitive plates or films.

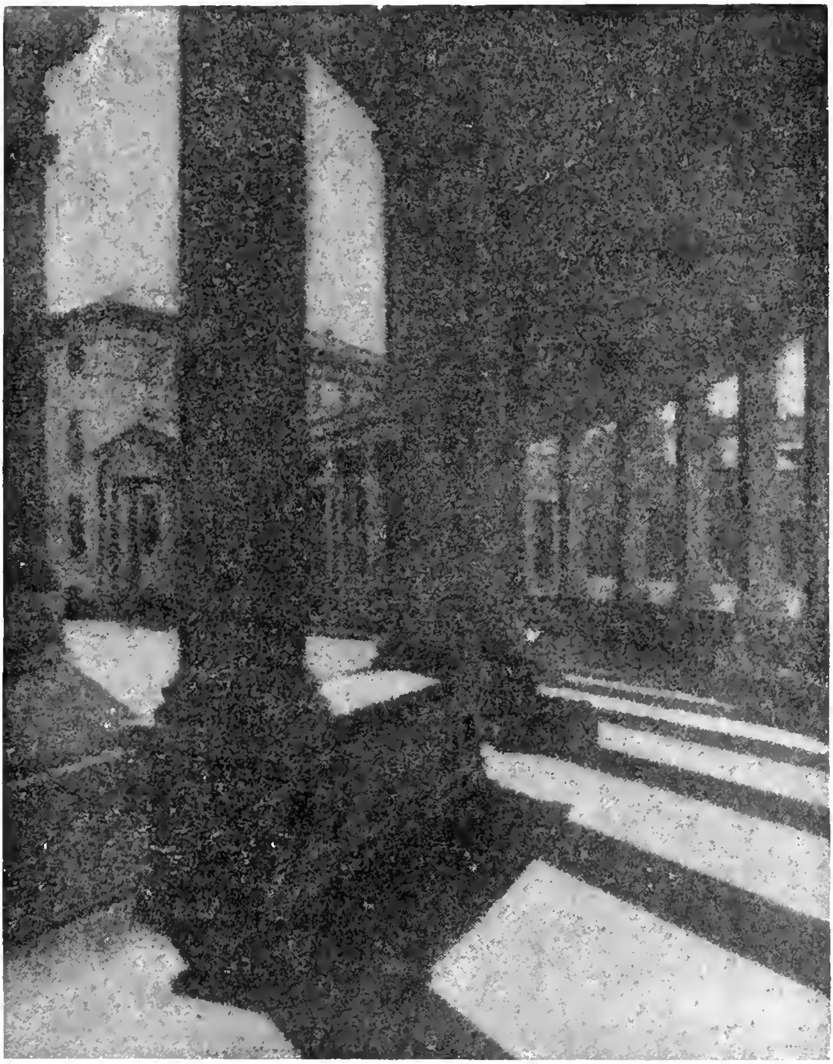
Barnet Ortho Screen This consists of a dyed film between optically worked glasses adjusted for use with the Barnet Ortho plates (J. L. Lewis, New York). It increases the exposure four times, and is therefore a generally useful screen.

Goerz Ray Filters These are made in three densities (Goerz Optical Co., New York), of optically worked, plane colored glass, fitted in a threaded ring adaptor to ensure correct adjustment to the lens with which they are used. Designed for general use with any make of ortho plate. The light filter increases the normal exposure five times; the medium filter ten times; and the dark filter twenty times—these figures being suggestive, not imperative, and varying with the characteristics of the plate employed, the subject and color correction desired. They are intended for use with Goerz lenses: other lenses require special fitting.

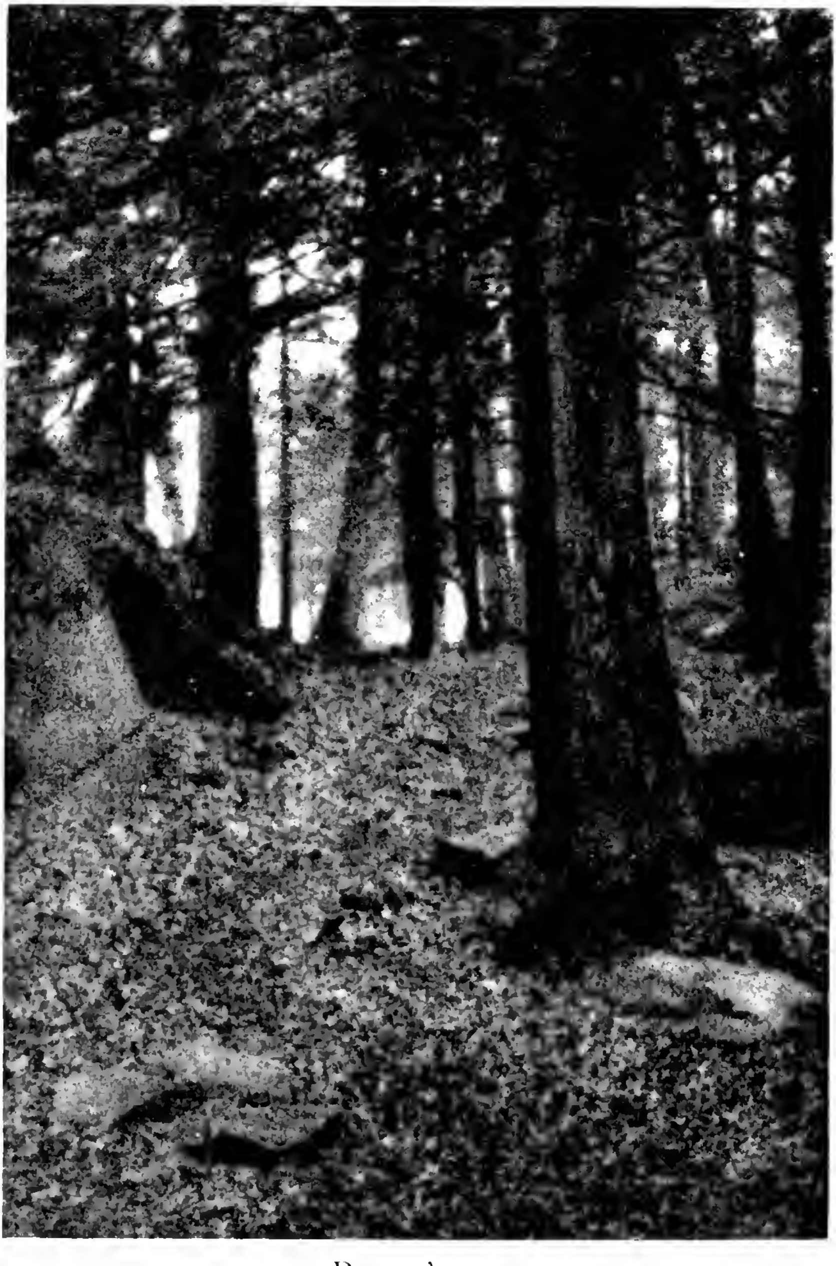
Zeiss Screens These consist of carefully selected plate-glass discs, yellow in color and made in three densities, increasing the normal exposure five, ten and fifteen times respectively. They are mounted in brass cells for insertion in the lens hood of various Zeiss lens mounts, for which they are especially constructed. Zeiss also makes a yellow glass light filter of better quality than the above, the glass being optically worked and centered for use with high-grade anastigmats. These are exceedingly luminous and increase the exposure five to ten times, according to the density of the filter. They are especially advised for copying colored prints or paintings, landscapes with large masses of dark foliage and similar subjects.

Beck-Harris Spectrum Filter It is claimed that this filter, obtainable in two qualities differing in optical finish, has greater luminosity or intensity than some other filters, thus giving the desired color correction with the least practical increase of exposure, the increase being from four to five times normal. Quality I is composed of two thick pieces of glass, each of the four surfaces being accurately figured to avoid any interference with the definition of an anastigmat working at its largest aperture, and intended for fine reproduction work. Quality II is for general ortho work, landscape, etc. The two series are constructed to fit the different lenses made by Messrs. Beck, London.

Viogtlander Filters The well-known firm of Voigtlander (New York) offers filters specifically designated as *Compensation* and *Contrast* filters for general use with all makes of ortho plates. The *Compensation* filter weakens or depresses the intensity of all the spectral colors except yellow-green, thus giving an approximation to the visual luminosity curve. It is intended for photographing subjects which do not contain a large proportion of dark red; in portraiture and ordinary landscape work. The increase in exposure is one and one-half to two times normal. The *Contrast filters* A and B, on the other hand depress the blue and violet rays in a larger measure, and are intended for distant views, mountain photography (glaciers, snow scenes, etc.) and the reproduction of paintings.



A Clever Attempt at "Moonlight"
W. H. Wallace



Drear Autumn
W. H. Wallace

A special *orange contrast filter* is provided where difficult subjects, including the full range of special colors, are in question, this giving full color value from dark red to blue-violet. These filters are apparently dyed films between optically worked glasses, carefully ground and finished. Contrast filters A and B are sufficiently luminous for use in instantaneous work with lenses of fairly large working apertures.

Resumé

From this necessarily brief survey we get two facts of interest. *First*, that there is no lack of choice among color filters for all kinds of ortho plates and for every purpose. *Second*, that as far as specially adjusted filters for particular plates are concerned, the European worker is better provided for than the American. The list of the principal color sensitive plates commercially available, on pages 348 and 349, puts the choice of plates and filters in a nutshell.

Practical Applications

Gathering up all that we have said on the theoretical side of our subject, we must put the knowledge and information to practical use. This includes nearly every kind of photography. The greater number of prints that are made are faulty in respect of their luminosities, as the reader can see for himself if he will examine them by the light of what we have said about the theory of orthochromatics. This fact clearly proves that the field of practical applications is a wide one. We will deal with a considerable number of them.

Backed Plates

First of all, a word as to the advantages of backed plates in orthochromatic work. It is the ideal way in which to use them, for it prevents halation in the negative, all the more to be feared when long exposures are given. Non-halation plates are quoted in our list, but for those who prefer to back their own plates we give a formula which has been proved to be good: Shake ½ ounce powdered castile soap in 10 ounces 95° alcohol, repeatedly, until partly or fully dissolved. The solution is ready for use when half the soap is taken up. Filter off 2 ounces of the soap solution and add to it 10 grains of erythrosin and 10 grains of aurin. Paint the backs of the plates

with this and allow them to dry. The work should be done in a deep ruby light. Before development, the backing can be wiped off with a wad of wet cotton and the plate rinsed in a tray of clean water. Back the plates as shortly before exposure as possible; if they are kept for any length of time they sometimes deteriorate around the edges, caused by exhalations from the backing. Negatives made on backed plates gain something more than freedom from halation; the images are brighter, crisper and pluckier, due to the scattering of light throughout the glass being stopped by the coating on the back surface of the plate.

Portraiture

For portraiture, especially in the studio, orthochromatic plates are invaluable. An ordinary plate, if the lens is sharply focused, shows all the irregularities of surface and color in the skin, so that, in the negative, much retouching of the face, neck and arms is necessary. The orthochromatic plate more harmoniously renders the surface texture of the skin, because it separates the shades or spots of color less abruptly than an ordinary plate. The color of the hair and the colors of the clothes are also more correctly suggested. Freckles are usually yellow or orange in hue, and therefore do not reflect so much blue as the rest of the skin. Generally for this work a yellow-green sensitive plate and an adjusted light filter of a medium color will give good results. Some modification of the studio lighting will be needed. An orthochromatic plate gives better modeling than an ordinary plate because of its power of evening up texture. Yellow blinds on the side light of a studio filter the light that falls on a sitter, and so take the place, to some extent, of a filter. In taking portraits by artificial light the placing of the yellow fabric between the sitter and the light will help the photographer to get a truer rendering of costumes or uniforms in bright colors. If the light is very plentiful, a light-colored filter should be used. The filter mostly required will be of the light variety, and so the exposure will only need increasing two, three, or four times the normal. With modern extremely sensitive plates and large aperture lenses, this is not a serious matter.

Artificial Light

In gaslight or incandescent-electric light portraiture, the yellow color of the light favors the orthochromatic plate and helps to give truer renderings. In flashlight work the plates are of marked utility. Most flashlight photographs on ordinary plates show excess of contrast, heavy shadows and faulty color luminosities. This is caused to a great extent by the light used being too rich in the blue-violet rays; if more yellow is introduced and a light filter with a yellow-green sensitive plate is used, then a proportionate increase in the volume of the light, to compensate for the longer exposure needed, will give negatives correctly recording the color luminosities of the original subject. Blues appear darker and yellows lighter when seen by gaslight than when viewed in daylight, and the color-corrected plate will translate those luminosities as the eye sees them. So that, to photograph artificially illuminated scenes as they would appear by daylight, a suitably adjusted compensating light filter and color-sensitive plate must be used. It is obviously wrong to photograph banquets, balls, and night functions as if they took place in daylight; but there are many photographs of groups, etc., taken at night, which are supposed to represent daylight effects, and for those the special adjustment of screen to plate should be made. Either a plane or a concave reflector, coated with orange chrome mixed with size, and with the light adjusted to its center, so that its rays are reflected upon the group or object to be photographed, can be employed. This illuminates the scene with yellow light, and a pale filter only need therefore be used.

Landscapes

In photographing landscapes, at any season of the year, orthochromatic plates and a filter are advisable, but are not always obligatory; the plates will often give improved results without a filter. But the exposure must be quite full and accurate, otherwise the green-sensitiveness of the plate will not record the color luminosities of a natural view, whose color "note" is the lush green of fresh verdure. For work of this kind, the Eastman N. C. film and other plates and films of the non-filter kind can be used to practical advantage; but for cer-

tainty of effect and for "all-round work" of many kinds, it is best to rely upon the filter. It is true that in the summer and fall, when the sunlight itself, especially toward the close of the day, supplies a natural screen or filter, you can do without one on the lens, but at some sacrifice of effect in exchange for the gain of short exposure. This is the common-sense reasoning of orthochromatic photography in a nutshell: "It does not matter how yellow the light may be, or under what conditions the photographer is working, or what the character of the work is that he is employed upon; so long as the plate and its adjusted light filter are used together, the colors will be correctly rendered in the same luminosity as the eye sees them at the moment of taking the photograph." So says Arthur Payne.

Summer

The ordinary landscape seen in spring and summer is chiefly a mass of greens and yellows, and for photographing such subjects plates sensitized for the yellow-green rays will be needed, and a screen of a yellowish green color. Some landscapes are dotted with buildings of a reddish or dark-brown hue; then it is an advantage if the plate is also red sensitive, and the filter passes the orange-red rays. The choice of a plate and filter is fixed by the dominant "note" of color in the view, and in this the eye and the judgment of the photographer must be discreetly exercised. Throughout the year nature undergoes many changes, and to each one of those changes the orthochromatic plate and its complementary light-filter can be adapted.

The Fall

In the fall the color of the foliage is different from what it is in the summer. The leaves are yellow, red and brown; so that the plates used must not only be sensitive to yellow and green, but also to orange and red. Green-yellow sensitive plates call for a longer exposure than plates which are also red-sensitive. A filter which passes orange and red light should be used; and then, with plates which are sensitized into the red, negatives will be got which will reproduce the warm luminosity effects seen in the later months of the year. Toward the close of the day in the fall, the light gets yellow in color, and

then it acts as a filter by coloring the plate with yellow light. It is true, as some workers claim, that a filter on the lens can be done without when the light itself is yellow in color; but it must be remembered that the blue-violet rays are still too active, and therefore the use of a properly adjusted filter is preferable if correct luminosities are sought.

Aërial Effects In landscapes exposed at midday, the lights and shadows in the landscape part may possibly be rendered harsh by the use of a filter. Moreover, the faint blue haze often seen in summer views may be quite cut out when a too deep filter is used; pale-colored filters therefore, should be used if it is desired to preserve these pleasing aërial effects. Over-correction exaggerates the contrasts; the photographer should aim at the happy mean. It is one thing to aim at the true rendering of the distant planes in a view, another to use a filter of such a tint that it sharply cuts out every suggestion of atmosphere and makes the photograph looks so unnaturally sharp and brilliant that the eye rebels at the exaggeration. In pictorial work with the camera, it is the suggestion of atmosphere and softening of distance which to many is the greatest charm of a photograph. In technical work, of course, the less atmosphere there is in the negative the better. Diagram 2 provides a suggestive index to the varying thickness and color absorption of the atmosphere according to the sun's altitude.

Winter In winter the yellow light weakens, and in landscape subjects the blue rays will become correspondingly strong. Snow scenes reflect blue light, and consequently the use of a filter becomes a necessity, and not merely a matter of choice. If the weather is dull, a deep filter will so brighten up the negative that it will look as if it had been taken in good diffused light. The haze that is often present in the atmosphere will also be cut out. Most winter subjects can be photographed on green-yellow sensitive plates, as red, brown and orange colors are comparatively rare in the views; but the light filter will be of a deep kind and the exposures, naturally, will be proportionately prolonged. The distance is generally

DIAGRAM 2

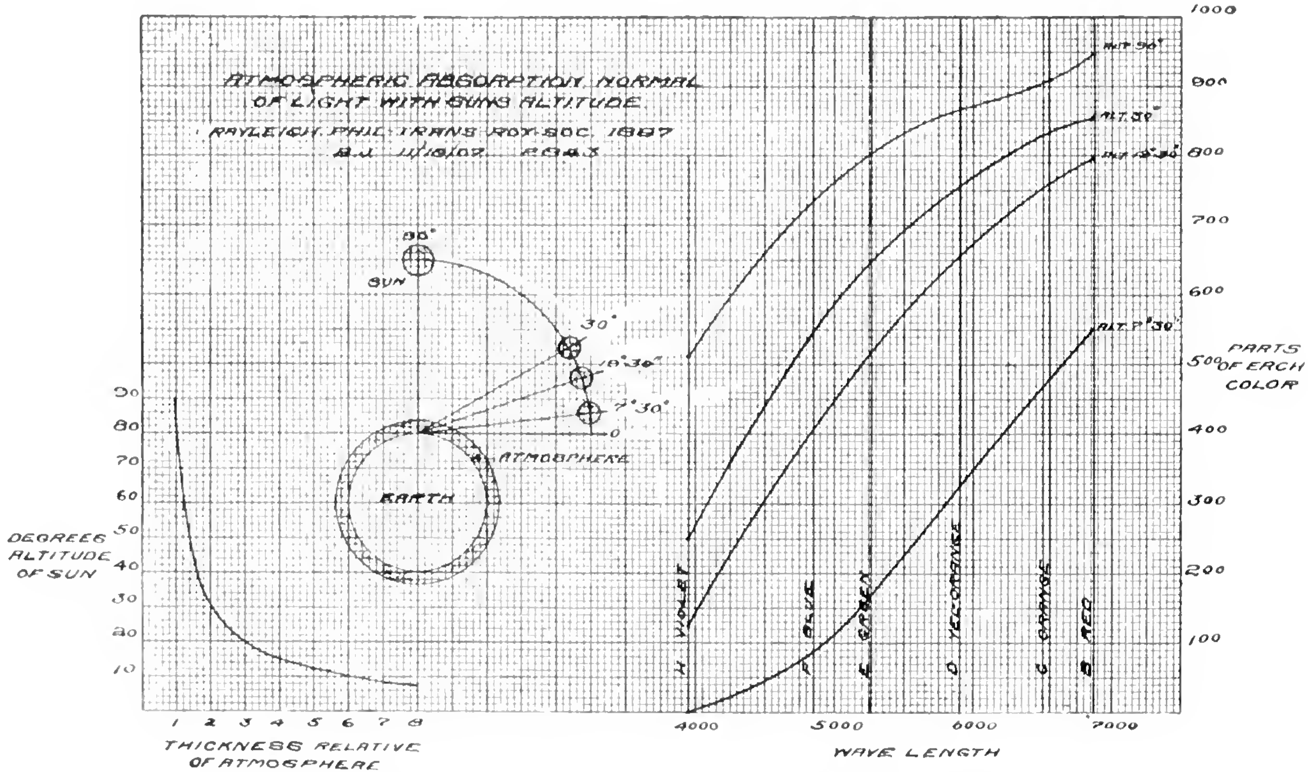


Chart Showing the Relative Thickness and Color Absorption of the Atmosphere According to the Sun's Altitude. Prepared by Julius Martin

very blue,—a further fact which makes the use of a filter necessary. Summing up the pros and cons of the use of a filter in landscape work, the balance of evidence and experience is in favor of a filter for *all* orthochromatic photography in the open. The two possible exceptions are generally green landscapes in soft diffused light, and highly yellow-colored views. But the improved renderings of those subjects on unfiltered orthochromatic plates can be still further improved by the blue eliminating powers of a filter, so that the balance of advantages is distinctly in favor of the latter.

Flowers and Fruit

Orthochromatic plates are indispensable with these subjects. Where there are flowers showing brilliant colors and others of slight luminosity, a slow plate should be chosen, and a filter used. Yellows and greens of almost equal luminosity *can* be successfully photographed without a filter; but it is preferable to use one for reasons already given. With red and orange colors, red sensitive plates should be used. The background influences the relative luminosity of colors in fruit and flowers. It should best be of a neutral color or tint, so that it does not reflect colored light on the subject.

Marine Views

Seascapes, shore views, and sailing craft of all kinds, should be photographed on orthochromatic plates. In this work we mostly have a great volume of blue light and very delicate values, so that comparatively slow yellow-green sensitive plates and a filter of a comparatively deep tint are needed. If there are moving yachts, plates of a more rapid kind and a lighter filter are essential. The great power of the illumination allows of quick shutter exposures even with a screen, as pointed out in No. 91 of THE PHOTO-MINIATURE wherein yacht photography is dealt with. A panchromatic plate and a Wratten 4-times medium screen have given F. W. Hicks good results in this class of work; the same worker has also successfully used pinacyanol plates in bright sunshine, *f* 8, 1-100 second and a 2-times screen, a 4-times screen, and Gilvus & Absolutus screens. For rendering white-sailed yachts against a blue sky, the deeper screens more effectively render the relative brightness.

Clouds The clouds in a landscape are frequently very important, if not the principal, objects. It is essential to show the contrast between the white cloud and the blue sky. In landscapes with clouds, use green-yellow sensitive plates with a light-yellow filter. For clouds alone, a deeper tinted filter and a slow orthochromatic plate with a small stop in the lens is the general way of working. Cloud-forms vary in definition, density and outline: for the heavier forms a light-yellow filter, and for the lighter a deeper one, will be required. For very great contrast, a red filter and a panchromatic plate can be used. When the sky is overcast, or what is known as a good diffused light is illuminating the view, a light-filter should still be used, as it is necessary to properly render the luminosity value of the sky in the print. *White* skies should never be seen in photographs; no such things exist in nature.

Colored Fabrics Fabrics such as carpets, tapestry, hangings, silks, woollens and cottons can have their true values shown only by orthochromatic photography. The color of all objects, as we have explained, is due to absorption, and this law of course applies to fabrics. Silk fibers reflect much more light than wool, and the colors of silk are richer and more luminous because of the extra white light with which they are saturated. Cotton fiber reflects more white light and the low translucency of the cotton fibers deadens the color. Woolen fabrics need the most exposure, next silk, then cotton. Carpets, chenille and velvets reflect very little white light, because the *ends* of the fibers are presented to the light, and, consequently require proportionately longer exposures than fabrics in which the fibers lie lengthways and sideways. Silk velvet requires a longer exposure than cotton velvet or velveteen, and the difference is greater the older the materials are. Single-color subjects will suggest the particular kind of orthochromatic plate and filter to use. In carpets and tapestries, we have variety of colors, in which red, blue and orange predominate in about that order. It is generally advisable to use a red-sensitive plate for the work and to give full exposures. It is a

point to be noted here that serious underexposure in orthochromatic work gives a thin negative, and so will falsify the luminosities; some will not be rendered fully, others will not be shown at all. On the other hand, overexposure shortens the scale of monochrome values, and the picture will be flat and lacking in contrast. Correct exposure is, therefore, of vital importance in orthochromatics. Thin negatives will not repay for intensification; nor, if the negative is too dense, is it worth while attempting to improve it by reduction. Orthochromatic photography is essentially a "straight" process; and the negatives do not admit of after-correction, if they are faulty in the first instance.

Stained-glass Windows

Cathedral interiors, buildings of yellow stone, are best photographed on orthochromatic plates. For stained-glass windows such plates are also essential. The colored light of the window is transmitted, and there are no reflections and no admixture with white light; so that, if the window is photographed on an ordinary plate, the red, orange and yellow will appear as black, the greens will be very dark, and the blues and violets will appear as white. Subjects of this nature call for panchromatic plates and filters of medium depth, which will cut out a moderate quantity of blue-violet. Much, however, depends on the predominant colors of the windows. These, as a rule, are decided and obvious so that the photographer is not much puzzled in his choice of a plate. We have written of the photography of stained-glass windows alone; when they are photographed simply as parts of an interior, they must be treated subordinately. Backed plates are advisable where windows form part of the subject.

Interiors

Most interiors are best photographed on orthochromatic plates. The color luminosities are better rendered than on ordinary plates and the shadow detail is improved, especially where there are red, yellow or green papers. When an orthochromatic plate is used to photograph bright-colored objects, such as an interior in which there are shadows lit by reflected colored light, the shadows are rendered in their true luminosities, the reflected light

taking its part in affecting the plate: An ordinary plate, not being color-sensitive, exaggerates those shadows. Where there is woodwork of different tints, or any definite scheme of harmonious decoration, or dark-colored furniture, red sensitive plates and a filter of light tint should be used. By artificial light, such as magnesium, the luminosities of interior subjects, as we have pointed out, will not be truly rendered unless the blue parts of the light are depressed by colored diffusers or reflectors, or the light itself is colored yellow.

Paintings

To reproduce paintings in oil or water colors, and colored designs, orthochromatic plates and light filters are essential. If the subject is illuminated by a light rich in yellow rays, the light itself will act as a kind of filter; but the use of a proper filter will nevertheless be a distinct gain. To choose a filter, look at the subject, under the illumination to be used, through two or three filters of different luminosity. For paintings with brilliant and light hues, a medium-colored filter is preferable; for old paintings, a deeper filter and long exposure give the best results. The photographer can also use diffused daylight, covering the window with yellow fabric or paper, so that the picture is bathed in yellow light. For evening work, gaslight or lamplight are good illuminants; to reproduce old paintings, direct sunlight should be used if possible. Where there are brilliant reds or orange-reds in the picture, plates specially sensitive to those parts of the spectrum should be used.

Character of Subject

In photographing paintings the dominant tone and character of the subject is an important factor in estimating the exposure. An "old master" and a Sargent will require different exposures. The colors of the modern pictures are more intense and luminous than those of the old pictures, which have been softened down by time. The older painters probably used less brilliant colors than their successors. A reasonable estimate is to put the exposure of the older picture as three times more than that of the modern. Water-colors reflect more white light and colored light than oil-paintings, and need less exposure under equal conditions. Pastels require still

less, proportionately; and illuminated addresses, where the groundwork is white or pale-tinted paper or parchment, least of all. An advantage of the orthochromatic plate worth pointing out is that it reproduces the very texture of the original. It is obvious that in photographing these old discolored subjects, the definition must be more accentuated on orthochromatic plates than on plates insensitive to yellowish brown colors.

Color Contrasts

In copying many objects, the photographer will often find it desirable to modify his method of working, and for this reason orthochromatics, as we have outlined the process in theory and practice, reproduce the luminosities of color—the *quantity* of light on the subject, but the color contrasts, or *quality* of the light, are not rendered at the same time; in other words, by pure orthochromatics, you can either increase or decrease the photographic intensity of a color, so as to introduce more contrast into the print. This is done by a proper selection of a light filter. To increase the intensity of a color, use a light filter of its complementary; to decrease the intensity of a color, use a light filter of the same color. Thus, the contrasts of red, yellow, green, green-blue and blue are increased by filters colored green-blue, blue, pink, red and yellow, respectively, in that order; they are decreased by filters of their own colors,—a little fact which it is easy to commit to the memory.

Copying

Among the subjects of which the varying of the contrasts is found necessary in practice, are copies of posters, labels, blue-prints, faded photographs, documents discolored by age, pen-and-ink drawings, and colored sketches. To copy a blue print on an orthochromatic plate, a red-orange or deep yellow light-filter is necessary. A yellow light-filter should be used for blue-chalk drawings on white or cream-colored paper, or pen-and-ink drawings in blue ink and on yellowish paper. For a faded silver print, in gaslight, use a blue light-filter; erased writings, or traces of them, or altered writings should also be photographed through a blue filter on orthochromatic plates. Forgery has been detected in this manner by a differentiation of the different-colored inks used. The

contrast light-filter also has many uses in scientific photography to which we cannot possibly make detailed reference in this monograph.

Commercial Applications The commercial applications of orthochromatic photography are numerous. Painted machinery, industrial implements, glass bottles, the contents of stores, books, furniture, bric-a-brac, metal ware; still life, such as game, meat, poultry, vegetables, flower farms, domestic architecture in progress, supply subjects in which frequently it is desirable to heighten the color contrasts for technical reasons. In such cases, a careful selection of the plate and the contrast light filter is called for, where the object can be photographed in the photographer's own studio, there he has the convenience of modifying the depth of color in his liquid light filter, if he has one in ordinary use. Most of the dyes already mentioned can be used for this purpose; it is thus easy for the photographer to make himself a whole series of filters for differential use in commercial orthochromatic work.

Safe-lights The flood of yellow or red light used when developing plates of the ordinary kind must be changed or cut down when we come to the development of orthochromatic plates, because of their greater sensitiveness to all colors. The "safest" light for green-yellow sensitive plates is one of deep ruby. When unpacking the plates or placing them in the holder or developing tray, keep them as far as possible away from the light. In development, when the solution is on the plate, cover the dish with a piece of black card or some other cover. Examine the plate as little as possible by transmitted light, in order to avoid fog. A small direct-vision pocket spectroscope is a handy device in orthochromatic development. Point it to the dark-room light, and, by carefully examining its spectrum, you can see what rays it passes. Some so-called "safe" lights pass blue and violet light; they should be avoided. The photographer can easily prepare a safe light, for use with red-sensitive plates, by fixing two unexposed plates and washing them. Then soak one of them in aurantia solution until deeply dyed; treat the other plate with naphthol yellow; when dry, flow

the latter plate on the film side with collodion deeply stained with methyl violet 6B, and when dry bind the plates together for use in the dark-room lantern.

Development Getting used to the dark-room light, and handling the plates with extreme care, are the only important variations in development as compared with ordinary plates. Orthochromatic plates are apt to gain density too rapidly. Pyro is a good developer for the plates; potassium bromide should always be used with it, so as to hold back the excessive density this developer is prone to give. The essential features of a developer to be used are that it shall be clean working and non-fogging. Rodinal used in the proportion of 1 part in 30 of water will be found suitable. Care should be taken not to underdevelop, or weak negatives will result; over-development gives harsh negatives. Practically any developer which gives good results on ordinary plates will do. A very safe plan is to develop by factor. Then the plate need only be exposed to the light for a few seconds, the time of appearance noted, the plate then put under cover and developed for the necessary time in total darkness. Wratten and Wainwright also supply definite data for time and temperature development of their Panchromatic and other color-sensitive plates. In developing nonhalation plates, it is necessary to employ a developer diluted with twice the usual bulk of water a full time so that it can penetrate to the lower film without over-developing the upper film. The use of ammonia in the development of orthochromatic plates should be avoided, as it fogs the plate.

BOOKS

Practical Orthochromatic Photography. By Arthur Payne. 1903. 178 pp. Illustrated. 50 cents.

Color Correct Photography. By T. Thorne Baker. 1906. 95 pp. Illustrated. 50 cents.

Notes and Comment

Standard Tests of Photographic Plates, by Edward S. King (Annals of Harvard Observatory, Vol. LIX, No. 1), 32 pp. with many tables and 6 plates.

This offers a concise record of prolonged experiments, 1896–1902, to determine the sensitiveness and other factors of certain photographic plates, having reference, apparently to their use in astronomical work. Despite the dryly scientific character of the monograph, the practical photographer can here and there glean an item of interest in everyday work, e. g: page 28 "for the Cramer *Crown* the image gains slightly by keeping before it is exposed, but loses density by being allowed to wait for development, while for the Seed G. E. 27 the conditions are directly the reverse."

On the Sensitiveness of Photographic Plates at Different Temperatures, by R. James Wallace. (Reprint from the Astrophysical Journal, Vol. XXVIII, No. 1, July, 1908.)

He we have another of the very practical contributions of Wallace to the scientific side of photographic work. "In 1895 Abney investigated the effect of temperature on the sensitiveness of photographic plates, giving his methods and conclusions in an address before the Royal Photographic Society (was it not the Camera Club? Editor) . . . Later, Edward S. King, of Harvard College Observatory, also made some experiments upon the influence of temperature upon sensitiveness. . . . When the results of these investigators are compared, they are almost directly opposed to each other. The work presented in this paper was undertaken in the hope that a greater concordance might be obtained by working under definite conditions." The methods and results are clearly explained. Incidentally Wallace

mentions that the new Lumière Σ plate gives a speed 2.3 times that of the Seed "27," but with much larger grain and a tendency to fog in development.

Tank development is making steady headway among professional workers, a sure sign that it will hereafter take a permanent place in practical photography. The firm of George Murphy Inc., New York, has introduced a professional tank of special design for those who use large plates or have to develop large quantities of exposures. The Eagle Professional Tank, as it is called, embodies every desirable feature suggested by experience with earlier tanks, and is noteworthy for the generous working space allowed in manipulation. It is fully described in the new Murphy catalogue, which can be had by sending 8 cents postage.

Two conveniences which the photographer will appreciate at sight come to our table from the Century Camera Company, Rochester, N. Y. One is the Century Negative Pencil for working on the back (glass side) of negatives, titling, modifying, building up weak portions, etc.; the other is the Century Spotting Pencil for spotting photographs, enlargements and the like. Both are much simpler and quite as efficient in use as the old-fashioned aids—India ink and brush.

The Seventh Annual Exhibition of Pictorial Photography, held at Wilkes Barre, Pa., a few weeks ago, under the auspices of the Wyoming Valley Camera Club, was attended with unusual success. The jury of selection this year was notable: Mr. W. T. Smedley and Mr. Will H. Low, whose foreword to the catalogue is full of encouragement. We congratulate secretary, R. L. Wadhams, and his associates in the good work.

Photographers everywhere will sympathize with Mr. B. J. Falk, of this city, in the severe loss he has sus-

tained by the disastrous fire which destroyed his elegantly equipped studio, opposite the Waldorf-Astoria, a week ago. The printing, mounting and finishing rooms, together with Mr. Falk's private "den," were completely wiped out. Unfortunately the "den" was a veritable museum of sketches, records and curios of photographic or artistic interest, rich with personal or historical associations. These treasures, gathered in a busy lifetime, cannot be replaced.

The Photographic Annual, 1908, briefly noticed in our last issue, seems to be filling the proverbial long-felt want. As the most complete of all books of its class, crowded with formulæ, methods, table and facts of photographic practice, it deserves its popularity. The discriminating buyer should note that the clothbound edition ($1) is interleaved with writing paper for the addition of personal notes or formulæ.

One of the most remarkable photographs we can recall was shown in the exhibit of the Goerz American Optical Company of New York, at the recent National Convention, held at Detroit. It was an enlargement, 40 x 80 inches, of a flashlight photograph of a banquet, showing over four hundred people, with every face clearly and distinctly defined despite the unusual enlargement, and possessing pleasing portrait quality. The lens used for the work was the Georz Dagor, Series III, No. 7A, to the excellent quality of which the enlargement bore eloquent testimony.

Camera Work (No. 23) for July, 1908, contains sixteen reproductions of Clarence H. White's photographs, which show the great range and versatility of this clever worker's abilities. It is probable that his simple portraits will make the widest appeal to the multitude, but all the work is thoughtfully conceived and effectively carried out.

The Souvenir of the 28th Annual Convention of the P. A. of A., recently held at Detroit, comes to us rich in beautiful reproductions of the pictorial exhibits at the Dayton meeting. There are also many articles by members of the Association. Congratulations to those responsible for the Souvenir.

The July issue of *Down Town Topics* (20 cents yearly: The Obrig Camera Company, New York) begins the seventh volume of this admirable little monthly. It contains an unusually large proportion of original matter, in which respect this journal gives example to some of its larger and more pretentious contemporaries. Among the special papers those on "Potassium Ferrocyanide in the Developer," by John Beeby, and "Photographing Live Stock," by Herbert Shearer, are worth several times the subscription price.

Editor Abel, of Abel's Photographic Weekly, has migrated to Scranton, Pa., where, in addition to the publishing of his newsy weekly, he is editing the monumental "Self-Instructing Library of Practical Photography," in eight bulky volumes, to be published by the American School of Art and Photography of Scranton.

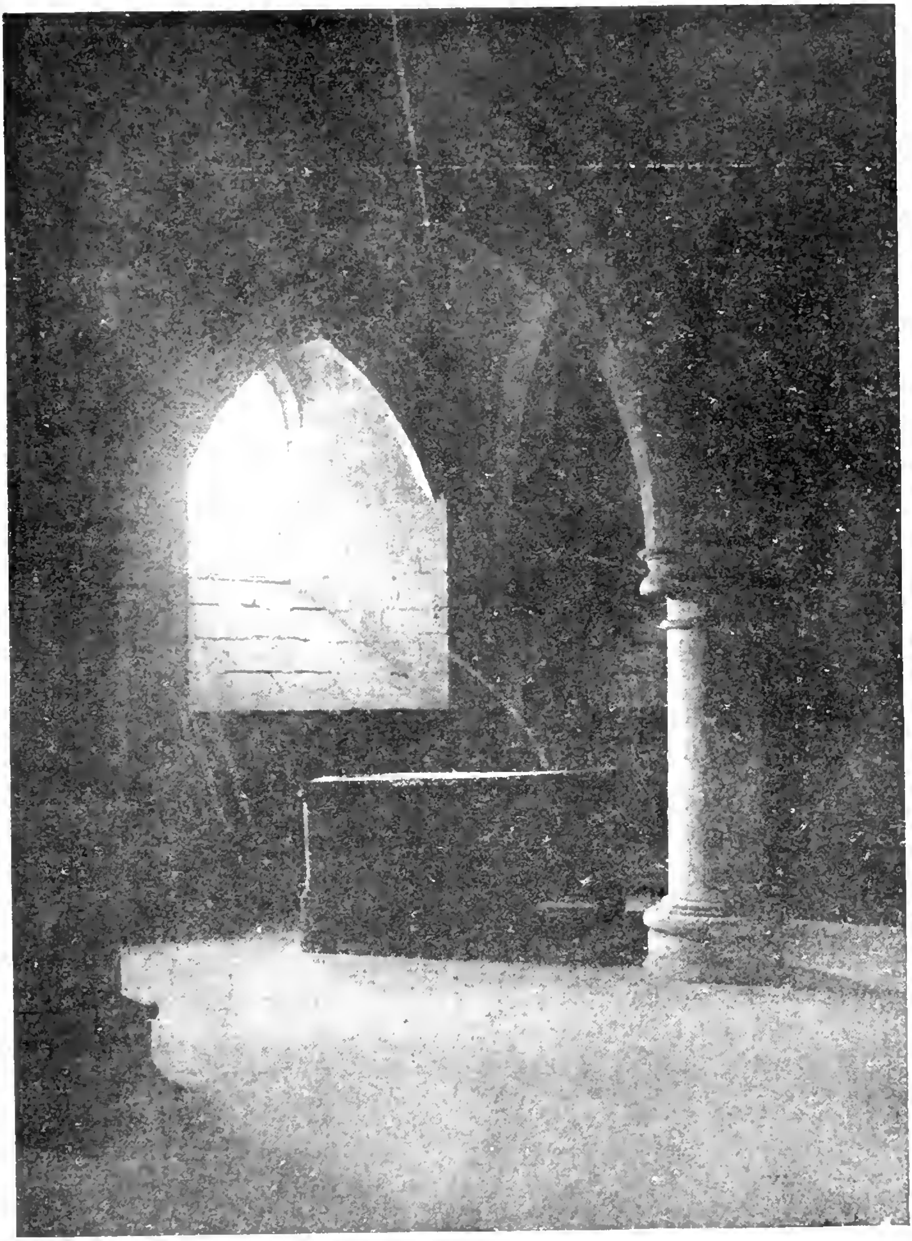
A writer in the "British Journal of Photography" suggests that in printing from harsh or "contrasty" negatives on gaslight papers the print may advantageously be made from the glass side of the negative; or a sheet of celluloid placed between the film and the paper, in order to get softly defined prints. The dodges are ancient, but well worth keeping in mind.

The "Color Photography" supplement of the "British Journal of Photography" for August 7, gives a description of the new Lumière Screen Plate, where the color grains are distributed over the plate in regular

squares or designs instead of irregularly, as in the present Lumière Autochrome plate. This is interesting as the use of regularly designed color bases may make it possible to duplicate the color records, a step toward prints in colors.

We are asked to state that the clever photograph of a tennis player on page 294 of our last issue was secured with the Multi Speed Shutter referred to on page 283 of the monograph in which the picture appears. The latter is interesting as showing the ability of the Multi Speed Shutter to stop even the fast motion of a tennis ball.

Congratulations to Editors Chambers and Bartlett on the completion of the first year of "The Bulletin of Photography"—52 numbers. (Philadelphia, Pa., $1.75 per year.) The "Bulletin" now sports a cover and shows many signs of becoming a veritable institution—like the venerable "B. J." across the water.



In the Undercroft: Wells Cathedral
S. G. Kimber, F.R.P.S.

In Westminster Abbey
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Development (Gaslight) Papers

When all is said and done, the print is the thing of supreme interest in photography. It is the print that the amateur wants, the pleasures of negative-making being anticipatory at best. It is the print that the professional sells, as the product on which he depends for fame and fortune. The negative is essential, but preliminary and intermediate, simply a means to the real end of all our work—the print. This has always been plain to the professional worker, but the amateur is slow in appreciating its full significance. So, until yesterday, we had the professional devoting endless patience and effort to the production of good negatives, as the surety of good prints; and the amateur putting his negatives into the hands of commercial printers because the making of prints seemed to be a messy and tedious operation, consuming the precious sunlight hours needed for negative-making, and ending all too often in discouragement and despair.

Until yesterday, I said. Today, we have development papers, and, with them, the difficulties and perplexities incidental to old-time methods have largely disappeared, the making of prints becoming at once the simplest and most interesting of photographic pleasures. Today, the professional is learning that, with development papers, he is freed from the old-time limitations, uncertainty of light and weather, difficulties as to the printing quality of negatives, and so on. The amateur

is learning that with development papers he can get good prints even from poor negatives and, with good negatives, prints rivaling in quality the superb platinotypes and carbons which have always held his admiration. More than this, with development papers he can make his own prints at his convenience, in the home, by any sort of light, day or evening, with a simplicity and certainty of result bordering on the wonderful. Development papers mark a new era.

The world moves—but slowly, and so development papers, although noisily exploited for some years past, are not so widely known and used as they deserve to be. Professional photographers are proverbially conservative; amateurs seem to have a mortal dread of even the suggestion of trouble. The purpose of this little book is to state the case for development papers as plainly as possible, by showing, first, how they simplify the making of pood prints and, second, how they make it possible to produce almost every desirable sort of print from any kind of negative—good, bad or indifferent. Other practical advantages will make themselves plain as we go along. The excursion is bound to be interesting.

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What are development papers? Briefly we may describe them as printing papers which give the picture image by development after exposure to a light under a negative. This distinguishes them from the well-known collodion and gelatine chloride papers, which are called print-out papers because they give a printed-out image by exposure alone. Development papers have another distinctive feature. They can be safely handled or manipulated in weak daylight or any yellowish artificial light such as gaslight, no "ruby" light or dark room being necessary in their use. In common use development papers are usually handled, exposed and developed by gaslight, hence the popular name gaslight papers. Latterly, the tendency has been to extend the range of light sensitiveness in these papers, so that today we have "gaslight" papers best adapted for use in diffused daylight as well as with gaslight, etc., and, on the other hand, we have development papers so closely approximating the more rapid bromide papers that they can be handled

safely only in a "safe" yellow light, such as that afforded by a sheet of orange or yellow paper placed before a gaslight or lamp.

Technically described, development papers are known as "washed chloride" papers, i. e., coated with silver chloride emulsions free from soluble silver salts, which plainly differentiates them from print-out chloride papers and bromide papers. Their preparation is held as a trade secret, but commerical papers are so universally available, and so satisfactory in quality and variety, that this is no disadvantage. Since, however, requests for information on the preparation of such papers come to the editor's desk with increasing frequency, the following typical gaslight paper emulsion is given from Eder's "Die Photographischen Kopierverfahren mit Silbersalzen," the authoritative work on the subject. As here described, the making of a gaslight paper looks very simple. In practice, however, there are many difficulties because of the endless variations or modifications required to make emulsions suited to different conditions, negatives, etc., so that the intelligent photographer will waste time and money if he attempts to make his own developing papers.

A "Gaslight" Emulsion

Make up the three following solutions: A: Silver nitrate, 300 grains; distilled water, 2 ounces. B: Gelatine, 320 grains; dissolved in water, 7 ounces. C: Sodium chloride, 90 grains; potassium citrate, 90 grains; water, 2 ounces. The operations from now on should be done in a "safe" light, such as that afforded by a dark room. Solutions A and B are warmed to 150° Fahr. and thoroughly mixed. Solution C, heated to the same temperature, is slowly added with gentle stirring. The emulsion so formed is next poured into a clean, cold dish or container and allowed to set as a jelly—protected from actinic light. This jelly is broken up and squeezed through coarse canvas or muslin, such as ladies use for fancy work, with an open mesh, into a porcelain container or vessel of convenient size and washed in running water for thirty minutes. It is now re-melted and poured into a clean porcelain tray set in a water bath at sufficient heat to just keep the emulsion fluid. The

paper, in cut sheets, may be coated by floating it on the surface of the warm emulsion, or the emulsion may be poured on the paper and evenly spread over its surface with a spreader of canton flannel, after which the coated sheets are hung up to dry, suspended by wooden clips, in absolute darkness.

The wise man, as aforesaid, will prefer to buy his paper ready for use as he needs it.

Rapidity or Speed

Roughly speaking, the average gaslight paper is about one-tenth to one-twentieth as rapid as ordinary bromide paper, which, as we know, is much slower than the familiar plate or film used in negative-making. Coming down to individual brands of development paper, however, we will find that they differ widely in light sensitiveness or rapidity. Take as examples Artura Iris and Artura Carbon Black. The first-named may be safely handled in diffused daylight, and with an average negative requires an exposure of from twenty to forty seconds north daylight, i. e., diffused, without sun; whereas the latter should be carefully handled in orange or ruby light, and requires an exposure of from seven to ten seconds only at twelve inches from the ordinary gas-burner or sixteen candle-power incandescent electric light. There is a wide difference here. The big fact to be grasped here is that, in spite of the name, gaslight papers should be treated with the same care one would give to a slow plate, and that they are liable to fog if this detail is neglected. Hence, except during the actual exposure, and subject to the makers' instructions or indications as to rapidity, gaslight papers should be shielded from direct light of any sort during manipulation, development, etc. This is not a difficulty or disadvantage, but simply a means of ensuring bright, clean prints.

Keeping Qualities

What about the uniformity and keeping qualities of development papers? As with all other sensitive products, so here; we are dependent on the manufacturers. It can be said without fear of contradiction that the great majority of development papers are as uniform in quality as the best makes of plates and films. Modern technical and business methods have assured this; photographic products

are now made on carefully calculated formulæ and the manufacturer whose goods vary in uniformity of quality speedily finds himself in difficulties beyond remedy. As to keeping quality, the rule with development papers is to guarantee them for a full year from date of manufacture; but I have made clear, brilliant prints on Velox over six years old and on Artura purchased more than four years ago. The advantages are obvious. One runs no risk of loss in keeping on hand a supply of many different varieties, for use as needed, and one can safely buy in such quantities as will ensure a reasonable price.

Permanency

Are "gaslight" prints permanent? The question is not an easy one to answer. In theory, a developed silver image properly fixed and washed should be absolutely permanent. Hence all makers of gaslight papers claim permanency for prints made on their papers. But everyone has seen faded and yellowed gaslight prints, despite claim and theory. Against this we must put faulty conditions of manipulation or in the storage of prints. So we reach the conclusion, borne out by experience in ten years, that the permanency of gaslight prints depends on the care and thoroughness given to their making; given absolute care throughout, permanency is assured; given reasonable care throughout, we may be sure of reasonable permanency. Dr. Leo Baekelandt, the inventor of development papers, tells me that gaslight prints developed with fresh, strong developer to a strong, neutral black color, thoroughly fixed in a new acid-hypo bath and well washed, have images composed of the most stable form of precipitated silver known and should last as long as the paper holding them. Permanency, then, depends on the man behind the print.

The Print

The normal print on development paper closely resembles the familiar platinotype in black or sepia. It can, however, be made to give many different effects. I have seen gaslight prints undistinguishable from sepia, black and green carbon prints of the best sort. The exquisite range of delicate grays peculiar to a bromide print may also be duplicated with development papers; so may the rough browns and blacks on tinted bases made

familiar by exhibition pictures on rough papers made by the double transfer carbon process. In short, there is no variety of effect possible with other printing papers which cannot be had with development papers.

Surface Varieties

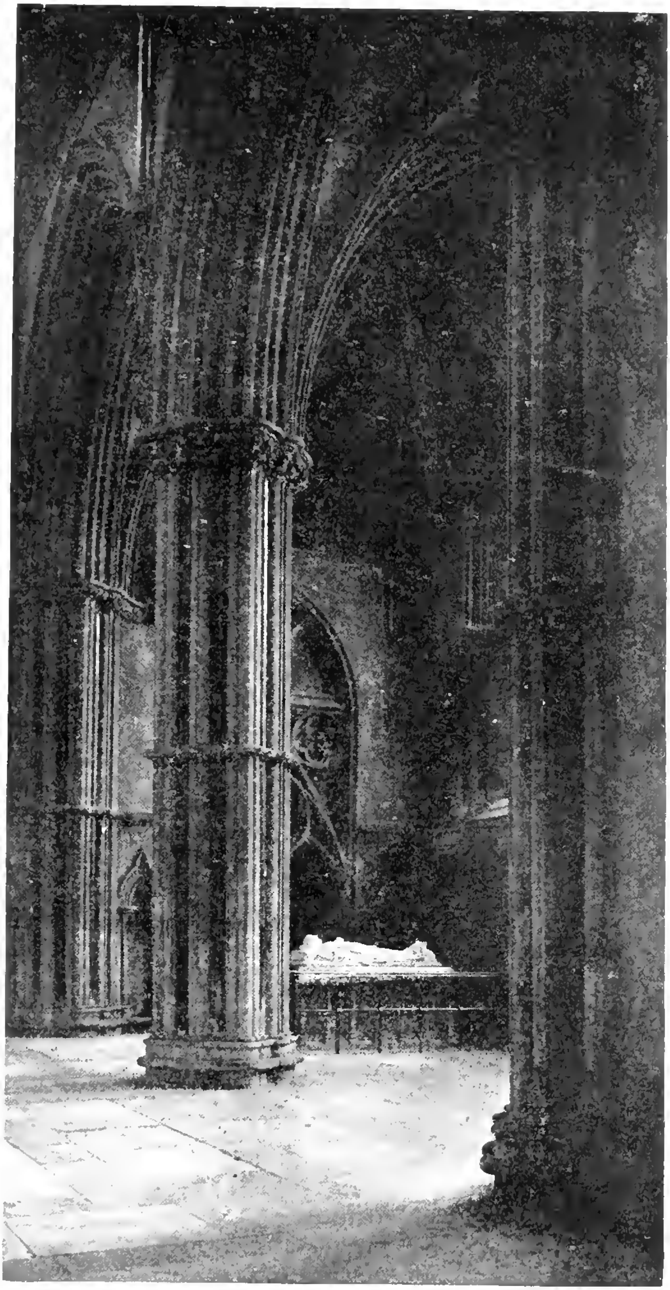
This brings us to the variety of papers available for our use. The range is so wide as to be likely to bewilder the reader. We have, first of all, glossy surfaced papers for commercial and reproduction work, giving all possible detail and depth, helping the negative in all its good points. Then come a dozen or more variations of "velvet" or "satin" or "vellum" surfaced papers, with a semi-gloss or sheen adaptable for many purposes and resembling the burnished albumen print of earlier years. These are followed by papers with a dull sheen or smooth surface, semi-matt, much favored by professional workers; then smooth "dead matt" papers which yield prints like smooth platinotypes or carbons on matt porcelain. After these come the semi-rough papers, some more or less finely grained, with "egg-shell" surfaces, followed by rough papers, varying in their roughness, until we reach the heavy extra rough for broad effects and large prints.

Colors

As already mentioned, the normal development print yields a rich black image. Prints in varying shades of black, rich dark browns, ruddy browns and sepia, olive, etc., are usually obtained by re-development, toning or after manipulation. But there are some papers specially made to give brown and red prints by exposure and development only. Artura green carbon, as its name implies, is intended to give rich green tones resembling carbons in that color; similarly, Royal Nepera is especially intended to give strong sepia prints on a heavy mellow toned paper. Two special development papers, Metalotype in America and Silvo in Britain, offer emulsions coated on a silver basic paper, yielding effects similar to those obtained by carbon prints on a silver transfer paper, very appropriate for special pictorial or commercial uses.

Emulsion Varieties

The greatest advantage possessed by development papers, however, apart from their simplicity in manipulation, is their remarkable adaptability to different classes of neg-



In York Minster
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In Norwich Cathedral
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atives. To this unique quality their rapid growth in popularity may be largely ascribed. It spells convenience, and the photographic world worships convenience more than all the other virtues. It means, too, that one can be sure of good prints regardless of the quality of the negative, which feature alone is sufficient to make development papers universally popular among amateurs as quickly as they become known. It is this feature, more than any other, which separates gaslight papers from all other printing papers and will eventually cause development papers to displace all other printing papers for general use, among professionals and amateurs alike. The print is the end, the negative being only a means to that end, and a printing paper which insures the best possible result from any and every negative is bound to oust all competitors.

Facts in Evidence

This is a big claim, but let us look at the supporting facts. As all experienced photographers know, the other printing processes, such as carbon, platinotype, bromide, albumen, plain silver, collodion and gelatine chloride require negatives widely differing in characteristics and printing qualities, if the best results are desired with any particular paper or process. Thus, a negative made to give a crisp, brilliant carbon or albumen print is not adapted for collodion or gelatine chloride print-out papers. Similarly, a negative made for platinum printing is not suited to bromide printing. Each process requires its own kind of negative. As a consequence of this, we had, until yesterday, the tradition that the negative must be made to suit the paper used for making prints. This rule worked practical inconvenience in many ways. One had to keep the printing-paper in mind while making one's negatives. Similarly, the professional who changed his printing process in general use found his earlier negatives ill-adapted to the new methods taken up, and so on. Then again, as we all know, the amateur's negatives differ as one star from another in their infinite variety and, in the first few years, most of them are useless for platinum or carbon printing, where technical quality is essential in the negative. So that, under the old régime, the beginner had good prints from his

few good negatives and poor prints from his many poor negatives; or he found himself obliged to intensify or reduce or manipulate his negatives to make them suit the printing-paper he favored; or he had to familiarize himself with several printing processes and accumulate the requisite equipment for the successful working of the different methods.

New Conditions

With the development-papers of today all this is changed. There is no longer need to make the negative fit the paper or to "tinker" with one's negatives in order to get a good print. There is a development-paper to suit every sort of negative and adapted to give any desired effect suitable to our ideas of different subjects. All we have to do is to know how to select the paper for the negative or subject in hand, or the motive or desire of the moment. We can, by this simple choice, get a wide range of wholly different effects in our prints even from a single negative. And, with all this, the essentials of manipulation or methods are unchanged; it is still simply a matter of exposure and development, with a possible re-development. Three trays and three bottles are ample equipment for all our needs; the making of a print means but a few minutes at most, and all the light we need can be furnished by an ordinary gas-burner or oil-lamp, or an inch or two of magnesium ribbon.

A Matter of Enterprise

Strangely enough, this remarkable elasticity offered by development papers is not in any sense due to qualities inherent in the papers themselves, but is wholly due to the enterprise of manufacturers in availing themselves of the possibilities of modification offered by the composition and make-up of gaslight emulsions. Taking advantage of this, and perceiving the essential simplicity of manipulation, they have placed on the market a bewildering profusion of many different grades of printing papers under the generic name of development or gaslight papers. Take Argo papers as an example: here we have no less than thirty-four varieties, all practically alike in manipulation though differing in their emulsions, speed and other characteristics, and lending themselves

to illimitable variation of results, as well as in their adaptability for every possible sort of negative. As with Argo, so with Velox, Artura, Cyko, Kruxo, Wellington S. C. P. and all the others. Once master the very simple manipulation set forth for any one paper and you are equipped to work them all successfully, with the widest possible field for individual choice as to the effect obtainable in the print.

Time Economy

Another consideration not to be overlooked is the notable economy in time offered by development papers. With the possibility of working with any artificial light or dull daylight and the factors of exposure and development made constant, wonderful things are possible. The amount of time saved depends, of course, on the equipment at the disposal of the worker. Working comfortably, *en famille*, I am content to turn out 25 to 30 prints per evening, single-handed, with an ordinary gas burner. But this is slow. Another worker says he puts sixty perfect prints per hour into the fixing bath under conditions similar to my own plus the able assistance of his wife. Pirie MacDonald, speaking as a professional, says broadly that "developing papers enable one man to produce more prints per day without daylight than any three men can make with it." Then there are printing devices and "machines" (so called) which make it possible to turn out hundreds of prints per hour, more closely alike than peas in a pod. It is plain that such a printing process offers amateurs, professionals and commercial firms alike a range of printing possibilities not hitherto available save by the bromide process with its inevitable dark room and solitary confinement.

The Table

With this preliminary survey we now turn our attention to the list of papers commercially available. This list I have arranged in tabular form for the convenience of the worker. It is not complete, but includes all the best-known makes in the American and British markets, with particulars as to their characteristics, speed and manipulation. At first glance this table may bring a sense of confusion and perplexity, because of the profusion of different papers offered for our choice. As the reader will

TABLE OF DEVELOPMENT (GASLIGHT) PAPERS

*Including the principal **American** and **British papers**. **Postcards** are not included. All the papers here listed are obtainable in America and Europe except those marked (B) which are believed to be obtainable in the British markets exclusively.*

NAME OF PAPER	Grades or varieties Surfaces: Weights	Characteristics indicated for use	Speed indicated by exposures suggested	Official Developers	Short Stop
ARGO* — Carbon	Each grade in Matte	Argo papers are made in 3 regular grades			
	Gloss	(a) Carbon (contrasty) for contrasty effects or soft negatives			
	Rough	(b) Portrait (normal) for negatives of normal contrasts or for soft effects	Regular grades 1 to 2 minutes		
Portrait ...	Lustre	This grade is also made in an Extra Rapid emulsion, differing in speed only from the regular grade		Defendol M-Q Amidol	2 oz. Acetic acid per gallon of water
	Velours		Portrait Rapid grade 10 to 30 seconds		
Special Portrait ...	Cardboard Matte Cardboard Gloss Cardboard Velours	(c) Special Portrait (soft) for very intense or contrasty negatives	With average negative at 12 inches from ordinary gas burner or 16 c.p. incandescent lamp. Half this time with Welsbach light		
	Portrait Argo Buff—normal grade emulsion on cream stock	for artistic effects			
Metalotype	Single grade, one weight	Development emulsion coated on a silver basic paper			
ARTURA—					
Iris	Regular weight—smooth lustre Extra Heavy—matte smooth Medium Rough—fine grain	Soft effects: for portraiture	Medium speed 2 to 4 seconds diffused daylight 1 to 2 min. 12 in. from an ordi-		
Ol...	Heavy—smooth Medium—rough	Pictorial effects without			

‡Non-Curling	Hard; Medium; Soft — Each grade in satin and matte surfaces	Hard—for flat negatives; Medium—for normal negatives; Soft—for contrasty negatives	30 to 60 sec. Welsbach light	M-Q. Formulae for other developers supplied on request to manufactur's	1 oz. Acetic acid No. 8 (28 per cent) to 32 oz. water
Carbon Green	Matte; Rough Matte; Extra Heavy—half matte	Green tones with carbon effects by development only	Slow speed 20 to 30 sec. diffused daylight		
Carbon Black	Glossy; Studio Special—half matte; Matte; Rough Matte—heavy weight; Dead Matte; Extra Heavy—half matte	For negatives of a wide range of contrasts; contact printing and enlarging. Should be handled in ruby or yellow light	Very rapid 10 sec. 12 in. from gasburner; 30 sec. oil lamp		
BARNET (B)— Gaslight	Matt and Glossy; Oyster shell—smooth, half matt	Thin to ordinary negatives	1 min 12 in. from gasburner	M-Q	
CELERIO (B)— Ordinary	Matt, Rough and Glossy	Thin to ordinary negatives		M-Q	
Soft	Matt, Rough and Glossy	Ordinary to hard negatives	1 min 12 in. from gasburner		
Slow	Matt and Glossy	Negatives of average contrast	"Slow" Celerio for daylight printing		
Nonstress	Glossy	Free from tendency to friction marks			
CYKO— Contrast (Blue Label)	Glossy	Blue Label—thin or weak negatives	1 min. 7 in from gasburner; 20 sec. 7 in. from Welsbach light	M-Q Ortol-Hydro	For professional grade short stop same as given for Artura
§Normal (Yellow Label)	Studio (velvet surface)	Yellow Label for normal negatives			
Soft (Red Label)	Semi-matte	Red Label for contrasty negatives	30 sec. 7 in. from gasburner; 10 sec. 7 in from Welsbach light		
§Professional (Brown Label)	Rough	Brown Label for portraiture or soft effects from strong negatives			
DEKKO (B)	Glossy; Matt; Velvet	Weak to average negatives	1 min. 12 in. from Welsbach light	Kodak Special or M-Q	
		Average to hard negatives	15 sec. 12 in. from Welsbach light		

*There are 34 varieties of Argo paper differing in emulsions, surfaces and weights. † Regular and rapid.
‡ Extra-heavy weight in Medium Satin. § Furnished also in double weight all surfaces.

TABLE OF DEVELOPMENT (GASLIGHT) PAPERS—Continued

NAME OF PAPER	Grades or varieties Surfaces: Weights	Characteristics indicated for use	Speed indicated by exposures suggested	Official Developers	Short Stop
GRAVURA (B)	Each grade in No. 1 Matt, No. 1 Glossy, No. 2 Matt	For negatives of average density	1 to 2 min. 12 in from gasburner	M-Q	
		For thin or weak negatives and warm tones to red chalk	varies as to color desired	Special for warm tones	
ILFORD	Matt, Carbon, Glossy	For thin to average negatives	1 min 12 in from gasburner	M-Q or Amidol	
	Portrait Matt, Portrait Carbon	Average to contrasty negatives			
IMPERIAL (B)	Rough, Smooth	Negatives of average contrast	10 to 90 sec 12 in from gasburner	M-Q	
KRUXO	Special Portrait—soft, semi-matt	For strong negatives			
	Carbon Matt—hard, semi-matt	For weak or thin negatives	Diffused daylight 3 to 5 sec. Gas, Welsbach light, etc 30 sec. to 2 minutes according to negative and distance from light	M-Q	Same as advised for Argo papers
	Dead Matt—smooth, lustreless				
	Velvet Matt—fine, smooth				
	Glossy—enameled surface				
	Art Kruxo (semi matt, dead matt, glossy)	Heavy non-curling			
	Kruxoplatin Medium and Rough	For platinum effects			
	Acme Kruxo (Regular weight, Heavy weight)	For portraiture and soft effects		Special formula given for brown tones	
LETO (B)	Matt Smooth	For average negatives			
	Special Portrait	Soft effects from vigorous negatives			
	Platino Matt—velvet surface	For platino effects	1 min. 12 in. from gasburner varying with the negative and light, distance, etc. Leto papers	Adurol or M-Q	
	Vellum	Carbon-like effects, semi-matt			
	Matt Rough	For negatives with vigor and contrast			

		toning	fogging tendencies	
	Cream Rough	For broad effects, vigorous negatives		
	Glossy	Commercial and reproduction work		
NEPERA	Velvet, Matt, Rough — Single and Double weight	For studio work. Adapted to the average professional portrait negative	Velvet Nepera is rapid. With average negative 2 to 4 sec. diffused daylight.	M-Q or Ortol-Hydro
	Royal Nepera	Heavy, mellow-toned pager stock for sepia prints by redevelopment		
VELOX—				
Regular........	Velvet—semi-gloss Carbon—matte Glossy—enameled Royal—matte, cream tinted	"Regular" papers print slowly but develop quickly; adapted for thin negatives lacking contrast	4 x 5 negative 7 in. from gaslight or 16 c. p. electric 2 min.; Welsbach light 40 sec.; oil lamp 3 min.	Velox N. A. or M-Q "Special" papers should have double amount of water in developer as compared with "Regular"
Special	Velvet—semi-gloss Portrait—smooth matte Rough—matte Carbon—matte Glossy—enameled Royal—matte, cream tinted	"Special" papers print quickly, but develop slowly compared with the "Regular" grade: adapted for vigorous or contrasty negatives, portraiture, etc.	Gaslight or 16 c. p. electric incandescent 30 sec.; Welsbach 10 sec.; average oil lamp 40 sec.	
WELLINGTON S. C. P..............	Matt, Glossy, Porcelaine, Art White, Art Tinted, Thick Matt and Thick Glossy	For weak negatives and brilliancy of effect.	1 min. 12 in. from gasburner	M-Q or Amidol
	Portrait Matt, Portrait Glossy and Semi-matt	For soft prints from vigorous negatives	30 sec. 12 in. from gasburner	
	Carbon—smoot matt	For prints of vigorous contrast		
YUNOX—				
Carbon	Matte — Contrasty	For thin, weak negatives	Average negative 7 in. from gasburner 20 sec. Correctly exposed print should develop in 10 to 30 sec.	M-Q
†Velvet	Semi-gloss — Contrasty			
†Glossy	Enameled — Soft	For strong negatives or soft effects		
*Platinum	Smooth matte — Soft			
Elton	Heavy weight—smooth grained	for average negatives		
Art Rough.......	Double weight—snow white, grained	Soft working		
Zona	Contrasty, Soft — Semi-matte	For proofing and "line" work		

* Platinum Yunox in double weight only.

† Furnished in double weight also.

undoubtedly confine himself at first to the products of one or two makers, this perplexity will quickly disappear, and the table will resolve itself into a series of groups, in which each separate paper is seen to be skillfully designed to provide for a definite requirement in every day photographic work.

A Series of Groups

Looking at these groups collectively for a moment, and remembering that photographic emulsions are technically graded as hard or "contrasty," normal, and soft, according to their relative capacity for rendering gradations of light and shade contrasts in a progressive scale from highest light to deepest dark, we see that each manufacturer aims, first: To provide two, three or more grades of paper or emulsions broadly covering the two or three classes into which all negatives may be divided, and, second: to offer as many variations of surface texture, finish, weight of paper and differences in basic paper stock as possible, in order to meet the requirements of all sorts of subjects and personal preferences.

How Graded

Taking the different grades, we see that for thin, flat, weak negatives, which may result from a dozen different causes, we have "contrast" papers which, by their steep gradation, emphasize or accentuate the too weak contrasts in our negatives and so give us vigorous and satisfactory prints. As examples of this class of papers we have "Regular" Velox, Cyko "Contrast," "Carbon" Argo, Artura Non-Curling "Hard," Kruxo "Carbon," Wellington S. C. P. Matte and so on.

For negatives with normal contrasts and that pleasing gradation which results from approximately correct exposure and development, such as we get in professional portraiture, we have "normal" papers which render all the gradations of such negatives with added softness. As examples of this class we have "Special Velox," Artura Iris and Non-Curling "Medium," "Argo Portrait," Cyko "Normal" and others.

Similarly, for very hard, strong or "contrasty" negatives, resulting from many causes, we have "soft" papers which by their long scale of gradation flatten and soften the harsh gradations of the negative and so yield

pleasing prints. Among the papers of this class we have Argo "Special Portrait," Artura Non-Curling "soft," Cyko "soft" and so on. It is chiefly by intelligent choice among these grades that we are able to make the paper fit the negative and so obtain the best possible results in our prints. In other printing processes each paper has its own fixed scale of gradation, sometimes long, sometimes short, and the negative must perforce be made to fit the paper if good prints are required on that paper—which spells difficulties innumerable.

Varieties in Grades

Taking up the sub-divisions of the different grades it is interesting to note how comprehensively the variety in taste and subject is covered. Thus in the Argo Carbon group for vigorous prints from soft or flat negatives, we have no less than eight varieties of surface finish or texture, weight and appearance: matte, gloss, rough, lustre, velours etc. Similarly, among Velox papers we have six different surfaces and two variations in basic stock; in Artura papers we have eight surfaces and two shades of black and green tones; in Nepera we have three surfaces and a special grade coated on a tinted stock. Careful study of the Table will reveal other variations.

More Advantages

It should not be overlooked that in this wealth of different papers we have not only variety, but also a ready means of closely fitting the paper to the negative, as well as meeting the requirements of different subjects and satisfying our personal preferences as to color, surface and general effect in our prints. By an intelligent choice of surface texture alone we can still further emphasize the dominant characteristics of the print previously determined by our choice of grade emulsion. For example, if we desire a soft print from a harsh negative, it is obvious that a matt or semi-rough paper will give us a print appearing softer to the eye than a print on glossy or lustrous paper of the same grade. Contrariwise, if we have a weak, flat negative and need extreme brilliancy in our prints from it, for reproduction or any other purpose, a glossy print on a "contrasty" or hard paper will give more apparent brilliancy in the image than a print on rough or matt paper of the same grade.

All this is simply suggestive and intended to lead the reader to look into the advantages offered by the remarkable variety of gaslight papers already available. Thus papers of the same grade by different makers will be found to offer slight differences further extending the variety of the group, so that the range of differentiation possible is practically unlimited. It is altogether a matter of knowing the papers in the market by actual experience with them, and there are many happy surprises in store for the reader who will "try out" these possibilities at his leisure, taking a single negative as a test and making prints from it on as many different gaslight papers as are readily available. Only in this way, after all, can one prove the comparative value of the different papers, and appreciate in an intelligent way the real advantages and usefulness of development papers as a class.

Summing Things up

The practical result of it all may be briefly summed up as follows. With development papers:

(1) We need no longer worry ourselves unduly about the technical perfection or imperfection of our negatives, or be content with indifferent prints because our negatives are indifferent in quality, since we are sure of a good print if we can find the particular development paper suited to the negative—and this is a comparatively easy task. This does not mean that we can be careless in our negative-making. Not at all; a good negative—one which reproduces all the gradations of light and shade in the subject by proportional opacities—will always give the best print and the largest liberty of expression in printing media. This is true in all printing processes and in none more than in printing by development. But it does mean better prints from the average negative and provides an immeasurable relief to both amateurs and professionals, who find themselves unable at all times to produce the particular sort of negative demanded by this or that printing method.

(2) The making of prints is enormously simplified in equipment, manipulation and time needed. There is nothing in the production of good gaslight prints which a boy of fifteen cannot master in two or three lessons.

Once we know how to fit the paper to the negative and select the variety which will give the effect desired in the print, it is simply a question of gauging the exposure needed for the paper and negative in hand. This once decided for any particular paper and negative, repetition under identical conditions will duplicate the result. Development is almost wholly automatic. A correctly exposed print develops steadily and progressively until it reaches the proper depth, when it should be removed. Fixing and washing need no comment. Since printing may be done with any desired illuminant, and the exposure is a matter of seconds, the number of prints turned out in a given time may be regulated by the convenience or dexterity of the worker.

(3) We have almost unlimited choice as to the kind of print we can produce from a negative, chemical effects, surface finish, color or tone of image or paper being variable at will, and all this without the necessity of changing manipulation, or learning new methods, or adding new equipment with each different grade and variety of paper; it is all simply exposure, development, fixing and washing, with perhaps redevelopment or aftertoning for special effects.

The A B C of It For the benefit of those who have yet to make their first trial of gaslight papers, I will briefly describe the simplest method of making prints, such as is employed by most amateurs who do their printing at home during the evening hours. Those with experience in the work can, therefore, skip this and the following pages.

Equipment The reader is supposed to have purchased two or three packets of development paper, the varieties chosen to suit his negatives on the information already given, and to have read carefully the working instructions enclosed with the paper. This latter is very important. He is also presumed to have at hand, ready for use, the developing and fixing solutions advised by the maker of the paper in hand. With some papers it is also necessary to have a few ounces of acetic acid for the "short stop" used for rinsing the prints between developing and fixing. All papers do not need this, some using clear

water. A bottle containing 10 per cent solution of potassium bromide (or a saturated solution if so specified) will also be useful. Apart from these items we will need three enameled ware or porcelain trays, a little larger than the prints to be made; a printing frame, fitted with a piece of clean glass free from defects or bubbles, if films are to be printed from; and a 4- or 6-ounce graduate. Most amateurs have these things already. All trays, graduates, etc., should be scrupulously clean. For a workroom we can use any room supplied with gas, a table, and running water. The ideal arrangement is to have two small tables, or a table and a broad shelf, one convenient to the water-supply, the other convenient to the gas light. On that near the water-supply we arrange our trays and solutions; on the other we put the printing frame, negatives and paper, working between the two. A shield or screen of some sort should be provided to prevent the light striking directly on the part of the printing table used for filling and changing the printing frame and also protecting the developing tray in the same way.

Arrangement

When ready for printing the three trays are arranged on the table or shelf convenient to the water-supply in the following order. No. 1, containing the developing solution, at the left-hand, with the bromide bottle alongside; No. 2, containing clear water (or acid short-stop if this is indicated in the instructions) at the right of the developing tray: and No. 3, containing the fixing solution, at the extreme right hand. A towel placed between trays No. 2 and 3 will be found extremely useful. It is very important to note that the fingers should never touch the fixing solution during all the operations, as this will lead to the contamination of the developer and give endless trouble.

A Trial Exposure

Now turn the gas half down and, shielding the package of sensitive paper from direct light or working in the shadow of your body, take out a piece of paper from the package and place it behind the negative in the printing-frame in the usual way. Be careful to place the emulsion side of the paper next to the film of the negative.

Light and shade in York Minster
S. G. Kimber, F.R.P.S.

Sunlight on an old oak doorway
S. G. Kimber, F.R.P.S.

If uncertain as to this, bite one corner of the sheet and the emulsion side will adhere to the teeth. Close the printing-frame, turn up the gas and, holding the frame in one hand so that the negative is parallel with the broad side of the gas flame at a distance of say seven inches, give an exposure of one minute. See that the gas light strikes squarely on the negative during the exposure. Now turn the gas half down again, remove the print from the frame and, placing one end of the paper in the developing solution, face up, give it a quick push with the finger tip so that the whole print slides into the developer and is fully covered.

Developing the Print

If the exposure has been correct, the image will at once begin to appear and gradually increase in depth of color. Some papers develop slowly, others rapidly; a very little experience will determine the character of the paper in this detail. If the image flashes up and grows dark all over within a few seconds, we may safely say that the print was over-exposed. In such an event, put a second piece of paper behind the negative and give it an exposure of half-a-minute, and then develop this second print as already outlined. Supposing the second print to develop to its right depth in a reasonable way and time, as soon as it reaches the desired strength in color, remove it quickly from the developing solution and rinse it for a few moments in tray No. 2, then immerse it completely in the fixing solution where it should remain fifteen minutes, after which it should be well washed in several changes of water or placed in running water for half an hour. It is all very much simpler than even this brief instruction indicates, and we can see what we are doing all the time. Of course, there are difficulties in handling different negatives, in judging exposure, and endless modifications; but the making of the first dozen prints will suffice to show how simple gaslight printing is, and to give abundant reasons for its popularity with photographers of all classes. After a little practice one can produce twenty or more prints per hour, working leisurely. Expert workers, handling gaslight papers day by day in commercial photography, can turn out hundreds of prints per day.

The first few prints, made by the novice ever so carefully, will probably be failures—harsh, or gray, or flat, or stained. This need not discourage. They were made simply to show the simplicity of the process, and the experience was well worth what it cost. As a method, gaslight printing is simplicity itself. But to turn out good prints on different papers from different negatives we need a larger knowledge of manipulation. When this is gained, it is just as simple to make good prints as to produce indifferent prints.

Two Facts

From his first experiments the novice will learn chiefly two things, (1) that success in gaslight printing most largely depends on a correct estimation of the exposure, and (2) that this is the only difficulty in the process. As the exposure necessarily varies with each different negative and variety of paper used, it is impossible to give specific rules covering the difficulty here. The only sure way is to ascertain the right exposure by experiment and note it on the negative itself, or its envelope, for future use. Once this is known for any particular negative and paper, successful prints can always be assured by simply duplicating the conditions of the first exposure as recorded in the way mentioned.

Simplifying the Problem

There are many ways of simplifying the problem. The first of these is to familiarize ourselves with the papers of one manufacturer, following the indications he sets forth in his working instructions. The more we know of the paper in hand and the amount of latitude it permits, so much the easier will it be to gauge the exposure required for this or that negative. Similarly, the more closely we can systematize our working methods, keeping the factors uniform by working under the same conditions, as far as possible, the greater will be the percentage of good prints. For example, by always using the same sort of light and working at the same distance from the light, using the same developer, and so on, it is obvious that we can eliminate many chances of failure. Another way of simplifying things is to classify one's negatives before printing, placing the thin, weak negatives in one group, the normal or good

average negatives in another group, and the strong, "contrasty" negatives in a third group. So classified, one or two experimental test prints will suffice to indicate the exposure for all the negatives in each batch.

Exposure Factors

The three factors generally governing the exposure of development papers are worth considering for a moment. They are: (1) the illuminant or light used; (2) the distance from the light at which the exposure is made; and (3) the density or printing quality of the negative. Let us look them over. In their instructions the manufacturers of gaslight papers generally state a preference for this or that sort of light and indicate roughly the exposure required by their papers with a given negative. The use of an ordinary gas burner is commonly advised; others advise incandescent gaslight or Welsbach light; the ordinary 16 c. p. electric incandescent light; oil lamps of various sorts, and diffused daylight. The electric arc is rarely advised, except for very slow

Comparative Table of Exposure Facts

Paper—Grade	Size of negative	Distance from light	Welsbach light	16 c. p. electric or 4 foot gasburner	Average oil lamp	North or diffused daylight
Velox—Special	4x5 or smaller	7 inches	10 sec	30 sec	40 sec.	
Velox—Regular	4x5 or smaller	7 inches	40 sec.	2 min	3-4 min.	
Cyko—Contrast	4x5 or smaller	7 inches	20 sec.	1 min.	1½-2 min.	
Cyko—Normal, Profess	4x5 or smaller	7 inches	10 sec.	30 sec.	40 sec.	
Artura—Carbon green	. . . . . .	12 inches	20 min.	45 min	. . .	20-30 sec.
Iris—Chloride, Non-curling	. . . . .	12 inches	30 sec	1-2 min.		2-4 sec.
Carbon black	. . . . .	12 inches	. .	10 sec	2 min.	
Argo—Regular	. . . . .	12 inches	40 sec	2 min	.	
Argo—Por. Special		12 inches		10 sec	2 min	

papers such as Artura carbon green, and for enlarging purposes. A useful comparison of the relative actinic or printing values of these lights may be had from the preceding table and notes following.

Other comparisons may be made from the speed column of the larger Table of Papers already given. Wherever possible, there is a big advantage in working by the same light at all times, the most constant light most readily available being the ordinary house gaslight. Incandescent gaslight or Welsbach light varies with the quality, age and condition of the mantle, but is practically three times quicker than the ordinary gas flame. When we can use daylight, and the middle of the day, with a north light open to the sky, daylight is extremely convenient, but the light is apt to vary.

Distance from the Light It is important to know how to intelligently vary the distance at which one works from the light source, as it is obvious that negatives of different sizes cannot be printed at the same distance from the light. Furthermore, by increasing or diminishing the working distance we can equalize our exposures for negatives which differ in printing quality; thus we would print a thin, weak negative at a greater distance from the light than we would one of normal contrasts, while a dense or hard negative would be exposed as close to the light, as possible. The comparative or relative intensity of light varies inversely as the square of the distance of the object from the light source. With this rule, if we know the intensity of our light (and exposure required) at any given distance, it is easy to ascertain the relative intensity (and exposure required) at any other distance.

The following table has been computed by E. Theo. Beiser in accordance with this law. By using it the calculations are simplified, and it will be found sufficiently accurate for all practical work.

Comparative intensity of artificial light at various distances.

Distance	3	6	9	12	15	18	21	24
Intensity	$\frac{1}{16}$	$\frac{1}{4}$	$\frac{1}{2}$	1	$1\frac{1}{2}$	2	3	4
Distance	30	36	48	60	72	84	96	
Intensity	6	8	16	24	36	48	64	

The figures opposite "intensity" show the comparative intensity of a light at the given distances. It is easily seen that the intensity at 12 inches is 4 times as great as at 24 inches, and inversely, one-sixteenth as strong as at 3 inches. To use this table with identical results, at all times, the conditions must be uniform, i.e., some method must be devised by which the light may always be of the same intensity, and a permanent marking off of the inches (from the core of the flame) should not be neglected.

Even illumination may be assured by placing the negative at a distance from light at least as great as its diagonal—a 4 x 5 negative at 6 inches; a 5 x 7 at 9 inches; an 8 x 10 at 12 inches, etc. It may occur that a print from an extremely dense negative is to be made, and the exposure at a distance of its diagonal from the light would require several minutes; and, too, probably several tests are required before the correct exposure is found. This means considerable time wasted, a disadvantage if one has quite a number of prints to make in a single evening, so we resort to the table just given and proceed as follows, supposing the case to be a 5 x 7 negative, rather flat, but of good density, requiring a slow, contrasty working paper:

We place a small strip of the sensitive paper in contact with an important part of the negative and print it at 3 inches from the light—taking care to have that part of the negative backed by the test strip on a level with the flame. We give one minute exposure, which, upon development, proves to be correct. Now, in the table we find the relative intensity of light at 3 and 9 inches, respectively (the latter distance being the diagonal of the negative), to compare as 1 and 8: thus, the exposure at 9 inches being 8 times as great. As it required an exposure of 1 minute at 3 inches, it is quite evident, then, that it will require 8 minutes at 9 inches.

Judging the Printing Quality

With a very little experience in gaslight printing and the habit of grouping negatives of the same characteristics together, the reader will acquire the ability to estimate the printing quality of his negatives by merely looking through them. Until that experience has

been accumulated, the only sure way to find the correct exposure is to make a trial print. In printing large negatives, of course, a small test strip of paper placed on part of the negative will be sufficient to indicate the exposure. When found, make a note of it for future use. The amateur who will devote an evening and a dozen sheets of 4 x 5 gaslight paper, cut up into test strips of convenient size, to the actual making of test prints will thereby secure a fair working grasp of the influence of the density of the negative on exposure and the grouping of negatives for the equalization of exposures.

Developers

In the choice of a developer for gaslight papers we have, theoretically, a wide range for personal preference, since almost all modern developers, with the exception of pyro, will yield good gaslight prints if properly handled. I have even used pyro, in combination with acetone, for gaslight printing with complete success. Practically, however, the range is very narrow, the makers of gaslight papers being unanimous in their preference for metol-hydroquinone, with occasional and somewhat perfunctory recommendation of amidol, ortol-hydroquinone, eikonogen, edinol and a few others. From the actual experience of a hundred workers we can easily gather as many different formulæ, each advised as offering some special advantage or convenience. But as a matter of plain fact there are few things more ticklish or uncertain than the average gaslight paper when once we leave the beaten track and begin to experiment. Development-paper emulsions are very delicately balanced, and the developer best calculated to give prints satisfactory in the vital details of brilliancy of image, gradation of tones, purity of color and contrast, is necessarily one which has been adjusted for use with a particular emulsion. For this reason the makers of gaslight papers constantly urge a close following of their formulæ, as best suited to their papers. As they alone know how their different emulsions are made up, this is common sense. Experience shows plainly that so long as the worker sticks to the makers' formulæ and working instructions, success is easy and comparatively certain. Individual experiment may result in advantage, or convenience, or economy

here and there, and some development papers possess remarkable latitude as far as chemical manipulation is concerned, but there is always a large element of uncertainty. In spite of all this, many workers will insist on the use of "something else," and the mention of any one developer is often sufficient to make another seem preferable. The following selection of developing formulæ for gaslight papers offers nothing which has not been advised from actual experience; nevertheless, the makers' formulæ should always have the preference when satisfactory results are sought. For this reason, the makers' formulæ, in condensed form, are here given first place.

The objection may be made that metol-hydroquinone is the standard development formula for all gaslight papers, and that many cannot or will not use metol. In such cases it is advised to apply to the makers of the paper in use, asking for a formula without metol adapted to the paper in question.

Sodium Sulphite

In making up developers for gaslight papers, much depends on the use of chemicals of standard quality, fresh and pure. This applies with special force to sodium sulphite, which is peculiarly liable to deterioration. As different formulæ advise various kinds of sodium sulphite, i.e., dry, dried, anhydrous, crystal, etc., it should be noted that in practice "desiccated," "dry," "dried," "anhydrous," and "dry-powdered" all mean the same thing, viz: chemical salts from which all water has been removed, and which thereby offer greater efficiency than the other sorts, i. e., "crystals" or "commercial." If it is more convenient in any case to use "crystals," take double the quantity of "desiccated" or "dried" called for in the formula. Similarly, if the formula calls for "crystals," and it is more convenient to use "desiccated" or "dry," etc., then take half the quantity of "crystals" specified in the formula.

Velox M-Q

For all Velox papers, metol-hydroquinone is advised, with ortol, edinol and Nepera solution as alternates, although no formulæ for ortol or edinol are published. The official Velox M-Q formula is as follows, the chem-

icals being dissolved in the order here given. Water, 10 ounces; metol, 7 grains; hydroquinone, 30 grains; sodium sulphite (desiccated), 110 grains; sodium carbonate (desiccated), 200 grains; 10 per cent solution potassium bromide, 40 drops. This developer will keep indefinitely if stored in bottles filled to the neck and well stoppered to exclude air. It should be used full strength as here given for "Regular" Velox, and diluted with equal parts of water for "Special" Velox. British readers are reminded that their "Vigorous" Velox is the equivalent of our "Regular" Velox, while their "Soft" Velox is our "Special" Velox.

Non-Abrasion M-Q

Most glossy or smooth-surfaced gaslight papers are liable to show abrasion or friction surface markings or streaks on development. This is usually overcome by the addition to the developer of potassium iodide in varying quantities. For glossy Velox papers a commercial preparation, Velox N. A. (Non-Abrasion) developer, is sold ready for use. This probably contains potassium iodide, but no particulars are given. Harry S. Hood, after considerable experiment, recommends the addition of 10 grains potassium iodide to the M-Q formula above given, as conferring the advantages of the non-abrasion feature. With this addition of potassium iodide, however, he advises only 18 drops of 10 per cent solution potassium bromide instead of the 40 drops of the official formula. It is worth noting that the proportion of potassium iodide here advised is 1 grain per ounce of developer, a much smaller proportion than that suggested in other formulæ for non-abrasion or "anti-friction" developers. A reason for this may be found in the fact that the addition of this salt tends to reduce the contrast in the print, this reduction varying with the amount of potassium iodide in the developer.

Nepera M-Q

For Nepera papers, intended chiefly for commercial or professional use, the following stock solution is advised. Hot water, 100 ounces; metol, ½ ounce; hydroquinone, 2 ounces; sodium sulphite (desiccated), 7½ ounces; sodium carbonate (desiccated), 12½ ounces; potassium bromide (crystals) 120 grains. In cold weather, add 13

ounces of wood alcohol to the above developer, after dissolving all the solids, to prevent precipitation. To render this developer non-abrasive, add ten grains potassium iodide to each ounce of the stock solution. The solution keeps indefinitely if stored in full bottles, well stoppered.

The normal developing solution is made up of 1 part stock solution and 4 parts water—for negatives of average contrast, and yields warm tones. Complete control of the contrasts in the print is secured by varying the dilution of the developer. The stronger the developer, the softer the print will be. Since the potassium iodide added to the stock solution has the effect of reducing contrast, it is clear that the softest possible prints can be secured by using undiluted stock solution for development where this is desirable.

Nepera Ortol-Hydro

Those who do not care to use metol will find the subjoined ortol hydroquinone combination altogether satisfactory with Nepera papers. Stir constantly while dissolving the salts in the order here given. Hot water, 100 ounces; ortol, ½ ounce; hydroquinone, 1½ ounces; sodium sulphite (desiccated), 7½ ounces; sodium carbonate (desiccated), 12½ ounces; potassium bromide (crystals), 38 grains. To render this non-abrasive, add 5 grains potassium iodide to each ounce of developer. This is a concentrated stock solution and keeps indefinitely if well bottled and stoppered. For use it is diluted as mentioned for Nepera M-Q.

Artura M-Q

The metol-quinol developer for all Artura papers varies only in the quantities of water, sodium carbonate and potassium bromide advised with the different brands or grades. In all Artura formulæ the use of a saturated solution of potassium bromide, instead of a 10 per cent solution is advised. One drop of this saturated solution is equal to ten drops of the usual 10 per cent solution. As Artura papers seldom show friction or abrasion marks, no non-abrasion developer is specified. If such marks should appear with these papers, it is suggested that 1 drop of a 1 to 4 solution of potassium iodide in water be added to each ounce of developer used. The

addition of iodide is said to make the prints more sensitive to light during development, so that care is suggested. It is also advised to double the usual amount of potassium bromide in the developer when the iodide is added for any purpose.

For Iris Dissolve in order here given: Water, 40 ounces; metol, 14 grains; sodium sulphite (dry), ½ ounce; hydroquinone, 60 grains; sodium carbonate (dry), ½ ounce. When ready to develop, add 1 drop saturated solution potassium bromide to each 2 ounces of developer.

For Chloride Identical with that advised for Artura Iris, except that 20 ounces of water are advised instead of 40 ounces, and the amount of potassium bromide solution used is 1 drop to each 3 or 4 ounces of developer.

For Non-Curling Same as for Artura Chloride except that the quantity of sodium carbonate advised is ¾ ounce instead of ½ ounce. The quantity of bromide remains unchanged.

For Carbon Green Identical with the formula for Artura Non-curling except that the proportion of potassium bromide solution is 1 drop to each ounce of developer.

For Carbon Black This is a very rapid paper and strict adherence to the maker's formula is advised, with care to prevent fogging of the print during development, which should preferably be done in safe light, i. e., one thickness of yellow post-office paper before a lamp. The developer is identical with that advised for Artura Chloride except that 1 drop potassium bromide solution to each ounce of developer is advised.

The manufacturers of Artura papers offer to send formulæ for ortol-hydroquinone, amidol, and edinol developers suited to their papers on request.

Cyko M-Q For all grades of Cyko paper the following formula is advised. Dissolve in the order here given, in warm water cooled to about 70° Fahr. Water, soft or distilled, 32 ounces; metol, 15 grains; sodium sulphite (dry, powdered), 1 ounce; hydroquinone, 60 grains; sodium

carbonate (granular) ¾ ounce; potassium bromide (crystals) 4 grains.

For professionals and others using Cyko papers in large lots the following formula is given: Warm water, soft or distilled, 1½ gallons; metol, ½ ounce; sodium sulphite (anhydrous), 16 ounces; hydroquinone, 2 ounces; sodium carbonate (anhydrous), 12 ounces; potassium bromide (crystals), 45 grains. This stock solution will keep indefinitely if stored in full bottles, well stoppered. To obviate abrasion or friction marks, add 6 grains potassium iodide to each ounce of this stock solution. For general use, take 1 part stock solution to 2 parts water. This gives blue-black tones; if warm black tones are desired, add ½ ounce potassium bromide (crystals) to the stock solution.

Cyko Ortol-Hydro As an alternative for those who cannot use metol, 1 ounce of ortol may be substituted for the metol, and 1½ ounces of hydroquinone instead of 2 ounces as given in the formula immediately preceding.

Argo M-Q For all Argo papers and Metalotype the following metol-hydroquinone formula is advised. Water, 10 ounces; sodium sulphite (dry, powdered), 120 grains; hydroquinone, 30 grains; sodium carbonate, 200 grains. When mixed, add 15 to 25 drops of a 10 per cent solution of potassium bromide.

Argo Amidol As an alternative to the above the following is suggested: Amidol, 20 grains; sodium sulphite (crystals), 160 grains; water, 8 ounces. When dissolved, add 5 to 10 drops of potassium bromide 10 per cent solution. Amidol developers should invariably be used within a few hours after being made up.

Argo Defendol Water, 8 ounces; Defendol, 60 grains; when thoroughly dissolved add sodium carbonate (dry, powdered), 240 grains. When mixed, add to the above 5 drops of a 10 per cent solution of potassium bromide.

For Argo Gloss, Lustre, Velours and Cardboard an anti-friction developer is advised, in which Argo soda—a commercial preparation—is specified.

Yunox M-Q For all Yunox and Yunit papers the following metol-hydroquinone formula is advised: Water, 16 ounces; metol, 10 grains; hydroquinone, 40 grains; sodium sulphite (dry), 240 grains; sodium carbonate (dry), 300 grains; potassium carbonate (10 per cent solution), 40 drops.

Ortol: Edinol If desired, the metol in the above formula can be replaced by 10 grains of ortol, or by 20 grains of edinol.

Amidol For special contrast with Yunox papers make up the following: Water, 16 ounces; sodium sulphite, 300 grains; amidol, 50 grains; potassium bromide, 1 grain. This developer should be freshly prepared for use as needed.

Metol When exceedingly soft prints on Yunox papers are required, the following developer is suggested: Water, 16 ounces; metol, 30 grains; sodium sulphite, 240 grains; sodium carbonate, 240 grains; potassium bromide, 1 grain.

Acme Kruxo M-Q Water, 32 ounces; metol, 14 grains; sodium sulphite, (dried), 300 grains; hydroquinone, 48 grains; sodium carbonate (dried) 300 grains. To this add 1 drop of a saturated solution of potassium bromide for each ounce of developer; more if needed to keep the whites clear.

Acme Eiko-Hydro For brown tones and warm blacks on Acme-Kruxo the following is advised: water, 20 ounces; eikonogen, 20 grains; sodium sulphite, (dried) 300 grains; hydroquinone, 48 grains; sodium carbonate (dried), 300 grains. Add to this, 1 drop saturated solution potassium bromide for each ounce of developer. Normal exposures with this developer give a warm black tone. For brown tones give two or three times the normal exposure.

Edinol R. T. Jeffcott gives the subjoined developer as producing fine black tones and clear whites, with good gradation: water, 10½ ounces; sodium sulphite (dry), 78 grains; sodium carbonate (dry), 155 grains; edinol, 16 grains; potassium bromide (10 per cent solution), 7 drops.

Edinol-Acetone Another edinol formula advised for use with Rotary papers is: water, 20 ounces; sodium sulphite (dry) 1½

ounces; edinol, 90 grains; acetone, 2 ounces; potassium bromide (10 per cent solution) 20 to 30 drops. This gives vigorous prints with rich contrasts from thin, flat or weak negatives.

Ilford Amidol Take 10 ounces warm water and dissolve in it, sodium sulphite, 1/2 ounce; amidol, 20 grains; potassium bromide (10 per cent solution) 2 drops to each ounce of solution as used. Make up a few hours before needed and use when cold, as amidol does not keep well.

Amidol For blue-black tones and vigorous prints Canon Day advises: Water, 10 ounces; sodium sulphite, 500 grains; potassium bromide, 2 grains; amidol, 50 grains. Use within two hours of making up.

Brilliant prints, with freedom from stains or discoloration follow the use of an amidol solution prepared as follows, says E. S. Pugh: Water, 10 ounces; sodium sulphite, 220 grains; potassium bromide, 7 grains; amidol, 20 grains. This has no tendency to irritate the skin, and development proceeds slowly so that one has complete control of the print. It does not keep well and should be used within an hour or two.

Rodinal The normal rodinal developer advised for gaslight papers is made up by adding 5 ounces of water to 1/4 ounce of rodinal, plus 1 grain potassium bromide.

Dianol Water, 32 ounces; sodium sulphite (anhydrous) 1 ounce; dianol, 80 grains; potassium bromide (10 per cent solution) 80 minims. This developer is best prepared freshly for use, as it will not keep.

Leto M-Q. For pure black tones on Leto gaslight paper the following formula is given: Water, 10 ounces; sodium sulphite, 1/4 ounce; metol, 10 grains; hydroquinone, 30 grains; sodium carbonate, 1 1/2 ounces; potassium bromide (10 per cent solution), 4 minims.

Imperial M-Q Water, boiled or distilled, 40 ounces; sodium sulphite, 500 grains; metol, 50 grains; hydroquinone, 40 grains; sodium carbonate, 500 grains; potassium bromide, 25 grains.

Barnet M-Q Water, 10 ounces; sodium sulphite, 350 grains; metol, 8 grains; hydroquinone, 30 grains; sodium carbonate, 300 grains; potassium bromide, 3 grains. For soft effects this can be diluted within reasonable limits.

Wellington S. C. P. Water, 10 ounces; sodium sulphite (crystals), 350 grains; metol, 10 grains; hydroquinone, 30 grains; sodium carbonate (crystals), 350 grains; potassium bromide, 3 grains or more as required.

Wellington Amidol Water, 10 ounces; sodium sulphite, 500 grains; amidol, 50 grains; potassium-bromide, 2 grains. This developer, which gives brilliant blue-black tones with Wellington S. C. P., should be discarded after three days.

Corthell's M-Q Among the many individual formulæ which might be given place, that of Wendell G. Corthell deserves mention as the result of an extended experience with many different papers. Water (distilled), 4 ounces; metol, 2½ grains; hydroquinone, 10 grains; sodium sulphite (anhydrous), 48 grains; sodium carbonate (anhydrous), 64 grains; potassium bromide (10 per cent solution), about 10 drops.

The amount of potassium bromide added should be just enough to keep a test slip white for a minute or more. The use of distilled water and pure chemicals is essential to a clear working developer. Store in 2-ounce bottles, filled full and well corked. For soft effects dilute the above solution with an equal bulk of water.

Toch's M-Q For the convenience of those who protest against the bothersome use of scales and measures, the following formula by Max. Toch, a chemist of considerable repute, is worth quoting. It has given me good prints with many of the best-known gaslight papers. Warm water, 1 pint; sodium sulphite (dry), an ounce bottle half filled (½ ounce by weight); metol, half a teaspoonful (30 grains by weight); hydroquinone, half a teaspoonful (30 grains by weight); sodium carbonate (dry), an ounce bottle half filled (½ ounce by weight); potassium-bromide, 10 grains. The amount of bromide is, of course, vari-

able according to the paper used and its requirements, some papers needing more than others to ensure purity of the whites and good blacks.

Development Methods

The development of gaslight prints is the most interesting part of the process and can be made as simple or as complex as the individual worker desires. First, we have development by simple immersion; second, by floating the print face down on the developing solution for a few seconds, and completing development by laying the partially developed print face up on a sheet of glass; and third, development by means of a mop of cotton or brush.

Development by simple immersion of the print in the developing solution is the simplest method for the beginner, as well as for the commercial worker where haste is essential, and this method is invariably recommended by makers of gaslight papers. To this end they have so balanced and adjusted their emulsions and development formulæ that, given correct exposure, the development of the print is purely mechanical—making for simplicity in manipulation and certainty in results.

When special effects are desired, as in dealing with portraits in white draperies against light grounds, vignetting, dodging, etc., modified developers being used to prolong the time of development, then the second and third methods are used in preference to immersion.

Equipment

For all the methods to be described, it will be as well to provide in the beginning 3 trays, conveniently larger than the prints to be developed and made of glass, porcelain or enameled iron ware. These should be kept scrupulously clean at all times and each tray reserved for its own particular use. Thus, tray No. 1 should be plainly marked "No. 1, Developer," No. 2 should be marked "Rinsing," and No. 3, "Fixing bath." It is, of course, possible to make good gaslight prints using a single tray in succession for all the operations, but there will be trouble sooner or later and it is poor economy to try it. Get the necessary equipment of trays in the beginning and see to their cleanliness. They will last for years and your work will be all the better and more satisfactory for the trouble.

For brush or mop development, we will need to add a supply of absorbent cotton, a tube or bottle with neck about five-eighths of an inch wide, to form a mop handle for the cotton, a flat camel's hair brush or two, from one to two inches in width, preferably set in rubber (not metal), and a piece of glass of convenient size to support the print during development. A glass graduate is handy at all stages and a long-nosed glass medicine dropper will often be found useful. Do not lose sight of the fact that most of these are accessories which may or may not be required. Three clean enameled-ware trays are the only essentials. Those who do not like to put their fingers in the solutions should provide a few rubber finger stalls, or a pair of dentist's tweezers, which latter should be kept scrupulously clean

Immersion

Development by immersion needs little description. Place the three trays side by side with a few inches' separation. Tray No. 1, containing the developing solution at the left, Tray No. 2, containing plain water (or acidulated water as the case may be) in the middle; and Tray No. 3, containing the Fixing Bath at the right hand, sufficiently removed from the others to prevent any possible contamination of the developing solution. If the reader can so arrange as to work between two tables, or between a wide shelf and a table, then the trays can conveniently occupy one table, or the shelf while the printing light, paper supply, frames, etc., can be handled on the other table. In such a case, of course, care should be taken to shield the light so that it will not fall directly on the paper or developing tray.

To develop, take the exposed print from the frame after shielding or lowering the light used for exposure, and gently slide it, face down, into the developing solution. Immediately turn it face up, see that no air-bubles have formed on the surface of the print and watch the progress of development. This will vary as to time occupied according to the exposure and the variety of paper used. Some papers develop in a few seconds, others take minutes—of which detail the reader should be informed beforehand. As soon as the print reaches the desired depth of color, quickly transfer it to the

rinsing tray of clear or acidulated water as the case may be for a moment or two, and then transfer it to the fixing bath, where it should be kept moving for a few seconds to insure thorough and complete fixing. In this bath the print should remain about fifteen minutes. In the case of prints which show a lemon color on development (due to the presence of potassium iodide in non-abrasion developers) this print should remain in the fixing bath until perfectly clear and white. Here the potassium iodide serves as a guide to thorough fixation, a very useful feature. After being well fixed, the prints should be washed in several changes of water, or in running water for half an hour, if this is available.

Flotation

This method of developing gaslight prints is favored by those who are already used to the method as employed in platinum printing and bromide work. A flat, not deep, developing tray is used, containing sufficient developer to give a depth of say half an inch of solution. The exposed print held by the two ends and slightly curved with the face outward is gently placed, face down, on the surface of the developer in such a way that the center of the print first touches the solution, after which the print spreads itself on the surface of the developer. The knack of doing this, without getting air-bubbles on the surface of the print or developer on the back of the print, is easily acquired by a little practice. After a moment or two, the print is gently removed from the developer and slid, face up, on to a wetted sheet of glass, on which it is securely held flat while development is completed. When the desired depth is reached, the print is transferred to the rinsing and fixing baths as already described above. What are the advantages claimed for this method, which looks more troublesome than simple immersion? First, it is said to give more brilliant prints with more pleasing gradation of tones, as the print is not soaked in the developing solution and the chemical action is wholly from the front of the exposed emulsion. Second, it calls for less developing solution and so is economical. I suspect, however, that its chief advantage in practice is that some men prefer to work that way!

Mop or Brush

For this method, first provide a clean dish or graduate which will hold from 4 to 6 ounces of developer, a sheet of clean glass which has been wetted, and a camel's hair brush or two of convenient sizes, or a mop made by inserting a plug of clean absorbent cotton (or cotton batting) in the end of a glass tube or a tubular bottle say five-eighths of an inch in diameter. Take the exposed print and lay it (dry) face up on the wetted glass which will hold it securely without sliding about. Now dip the brush or mop in the developing solution and pass it rapidly, with first an up and down and then a crosswise motion, over the face of the print, covering the whole surface quickly and evenly. When development is completed, rinse the print quickly and transfer to the fixing bath as before. The developing solution used in this way should be drained from the print into a separate dish or bottle and reserved for use with prints where a little more than normal contrast is desired, as used developer has a tendency to increase the contrasts, fresh, unused developer tending towards softness. The cotton mop should be discarded as soon as it shows any stain or discoloration; if a brush is used, it should be cleansed from time to time. This method requires a little practice to acquire proficiency, but is speedy and economical, especially where large prints or quantities of medium-sized prints are concerned. It also lends itself to modification during development where this is desirable and the worker has acquired the know how. When rough-surfaced papers are used, care is necessary to avoid rubbing up the surface by too harsh handling of mop or brush. In the case of hard or glossy surfaced papers, a non-abrasion developer is a necessity if marks and streaks are to be avoided

Personally, for small work done at home during the all-too-short evenings, as well as for large work done in the work-room, I prefer the simple development by immersion; but I have in mind a man whose gaslight prints are among the best I have seen, and he combines the mop and immersion methods; first immersing the prints in the developer to get them started, then brushing them on the glass support until he secures the desired depth.

Between Developing and Fixing

With some papers, such as Velox, Cyko and Yunok, the developed prints are rinsed for a moment in clean water to remove excess of developing solution, and immediately transferred to an acid fixing bath. Other papers, such as Artura, Argo, Kruxo, etc., are first immersed in an acid bath known as the "short stop" for a few moments before being placed in the fixing bath. This short stop checks the action of the developer and neutralizes the alkali adhering to the print, thus helping to keep the tones clear and free from veil or tendency to stain. So long as this acid "short stop" remains acid, its precise make up is not important. For Argo papers 2 ounces of acetic acid to a gallon of water are advised. The makers of Artura papers insist on the use of 1 ounce of commercial acetic acid No. 8 (28 per cent) to 32 ounces of water. The "short stop" bath should be kept fresh by frequent renewal and each print added gradually neutralizes it. Where quantities of prints are developed and left to be fixed all at one time, the use of an acid "short stop" bath between development and fixing is essential.

Fixing Baths

American gaslight papers are invariably fixed in an acid-hypo bath. The makers of British papers, with a few exceptions, seem to prefer a plain fixing bath of hypo and water. It is always advisable to follow the formula given by the makers of the paper used. The following bath given for Velox papers is typical of all the American formulæ. Dissolve 16 ounces of hypo-soda (crystals or granulated) in 64 ounces of water. When thoroughly dissolved, add the following hardening solution, dissolving the chemicals separately and in the order named: water, 5 ounces; sodium sulphite (desiccated), ½ ounce (or "crystals," 1 ounce); acetic acid No. 8, 3 ounces; powdered alum, 1 ounce. The Cyko formula is identical with that given for Velox. The Artura formula advises sodium sulphite (crystals), ½ ounce, and powdered alum, ½ ounce; the Argo formula is practically the same as for Velox; while the Kruxo formula varies only in advising sodium sulphite (crystals), ¼ ounce. In the Yunox formula the varia-

tions are: hypo-soda, 12 ounces; sodium sulphite (dry), ¼ ounce; and powdered alum, ½ ounce. These acid-fixing baths may be used repeatedly and keep well. Prints are thoroughly fixed after 15 minutes immersion, but care should be taken to keep them moving and separated from each other. A 64-ounce bath will suffice to fix 300 4 x 5 prints. When muddy or discolored, it should be renewed. It is important that the fixing bath should be kept at a temperature of as near 50° Fahr. as is possible.

The plain hypo fixing baths recommended for British papers is made up of hypo-soda, 4 ounces; water, 1 pint (20 ounces, English measure). With such baths the preliminary acid "short stop" treatment is essential to prevent stains and discoloration.

Washing

When thoroughly fixed, gaslight prints are transferred to running water and well washed for half an hour. If running water is not available, they should have at least twelve changes of water and be kept well separated, remaining in each lot of water about ten minutes.

Toning Methods

There are as many methods of toning gaslight prints to obtain various shades of brown or sepia as there are ways of killing a cat. Some of these methods are adapted for use only with particular makes of paper; others are obviously experimental and uncertain in result. To deal with the matter fully and with satisfactory detail would extend this monograph to a tedious length. Hence I give the two best-known and most reliable methods here, leaving the reader to work out other methods with the help of the manufacturer whose product he is using.

Sepia by Hypo Alum

Prints to be toned by this method should be fully developed, a shade darker than usual and inclining to a blue-black in color. It is unnecessary to add that they should be thoroughly fixed and well washed before toning. Mix the following bath: Boiling water, 128 ounces; hypo-soda, 16 ounces; alum, 4 ounces. When dissolved, allow this to cool and add a solution made up by dissolving silver nitrate (crystals), 1 dram; common salt, 1 dram; in 1 ounce of water. If this bath is heated

to 100° Fahr., the toning will be completed in about thirty minutes; if used cold (overnight) the toning process will occupy from ten to twelve hours. The prints should be well immersed in the solution and evenly covered with occasional stirring of the bath during the earlier part of the process. Other than this no particular attention is necessary, as the toning usually proceeds evenly to sepia and there stops. The prints should be placed face up in the bath and only a few prints toned at one time with an abundance of toning solution. This method is given for Artura Iris, but has served me equally well with Velox and Argo papers.

By Re-Development

This method has latterly gained wide favor as quicker than the above, but I do not think it offers any improvement in results. The fully developed, thoroughly fixed and washed prints are first immersed in a bleaching bath made up as follows: *Stock solution.* Water, ½ gallon; potassium ferricyanide, 1 ounce; potassium bromide, 1 ounce. For use, take 10 ounces of stock solution, add 20 ounces of water, and then add 15 drops of Aqua Ammonia (strong ammonia water, *not* household ammonia): In this bath the prints are left until the deepest shadows are light brown in color. When this point is reached, remove the prints and rinse them in two or three changes of water, after which they are placed in the re-developing solution as follows: Prepare a *stock solution.* Water, 16 ounces; sodium sulphide (not sulphite), 1 ounce. For use, take 2 ounces of this stock solution and add 30 ounces of water. In this bath the bleached prints will gradually turn to a warm brown color which deepens until we have sepia prints of desirable strength and brilliancy. The process occupies only a few minutes and is said to give absolute permanency to the print.

After toning by either of these methods, the prints should again be thoroughly washed for half an hour in running water longer is not advisable.

Drying

Unless a little care is used in drying, gaslight prints are apt to curl and twist awkwardly. The simplest method of ensuring flat prints is as follows: After washing the

prints as directed, remove them from the wash-water and lay them face up on clean lintless blotters, care being taken to blot off the superfluous moisture. Another way, which is to be preferred when a large number of prints are to be dried, is to place them on a clean glass in a pile, face down. Cover them with a blotter and with a squeegee roller, press out all superfluous water. Then lay them out separately, face down, on cheese-cloth stretchers, which may be constructed by making a framework of light wood, and tacking bleached cheese-cloth tightly over it.

Prints dried in this manner will curl but slightly. If after being dried they have a slight tendency to curl, they can be made to lie flat by placing face down on some smooth surface and then drawing a ruler over the back of the print with a slight pressure, lifting the print as the ruler passes over it. When this is being done, care should be taken not to bend any portion of the print too sharply, as by so doing the gelatine surface might crack.

Another method is to dry the prints on cheese-cloth stretchers, and then they are placed face down and their backs sponged with water. After that they are put under pressure between blotters.

Enameling Prints

Glossy surfaced papers can be enameled either by the familiar method of burnishing or by the simpler method of squeegeeing to ferrotype tin plates as follows: Take prints from the wash-water and place face down on a ferrotype tin, squeegee into absolute contact and allow to become bone dry, when they will peel off with the desired luster. If the tin has been in use for some time, portions of prints may stick; to prevent this, prepare the tins as follows:

Dissolve ten grains of beeswax in one ounce of benzine; allow this to stand for a few hours, in which time a precipitate will be formed. The clear solution should be used for polishing the tins, applying to the surface of the ferrotype plate with a soft cloth (canton flannel). When the surface of the tin has been thoroughly covered with this preparation, the tin should be polished with a piece of dry canton flannel to re-

move as much of the beeswax as possible. As beeswax varies in its composition to a certain extent, the solution may vary somewhat in consistency, so that an addition of benzine may be necessary to permit polishing the tins more easily.

Mounting The mounting of gaslight papers does not materially differ from the procedure adopted with other papers, except that the heavier papers need fresh, strong paste and a stiff brush in order to work the paste well into the back of the print. The new dry mounting tissues are also very convenient when perfectly flat prints are to be mounted in quantities. The extra heavy gaslight papers are generally used unmounted, being often printed with a margin to add to the effect.

Here we must perforce make an end to our excursion Many interesting things are omitted, such as combination or double printing, masking prints to get margins, the use of printing machines for producing large quantities of prints, a résumé of failures and remedies, and so on, simply because no book of less than five hundred pages could adequately tell the story. My purpose was to interest the reader in the wonderful possibilities offered by the many varieties of gaslight paper and to show the simplicity of its manipulation, not to bewilder him by an elaboration of complexities. Once well started, the intelligent worker will find his interest leading him into "many inventions."

BOOKS

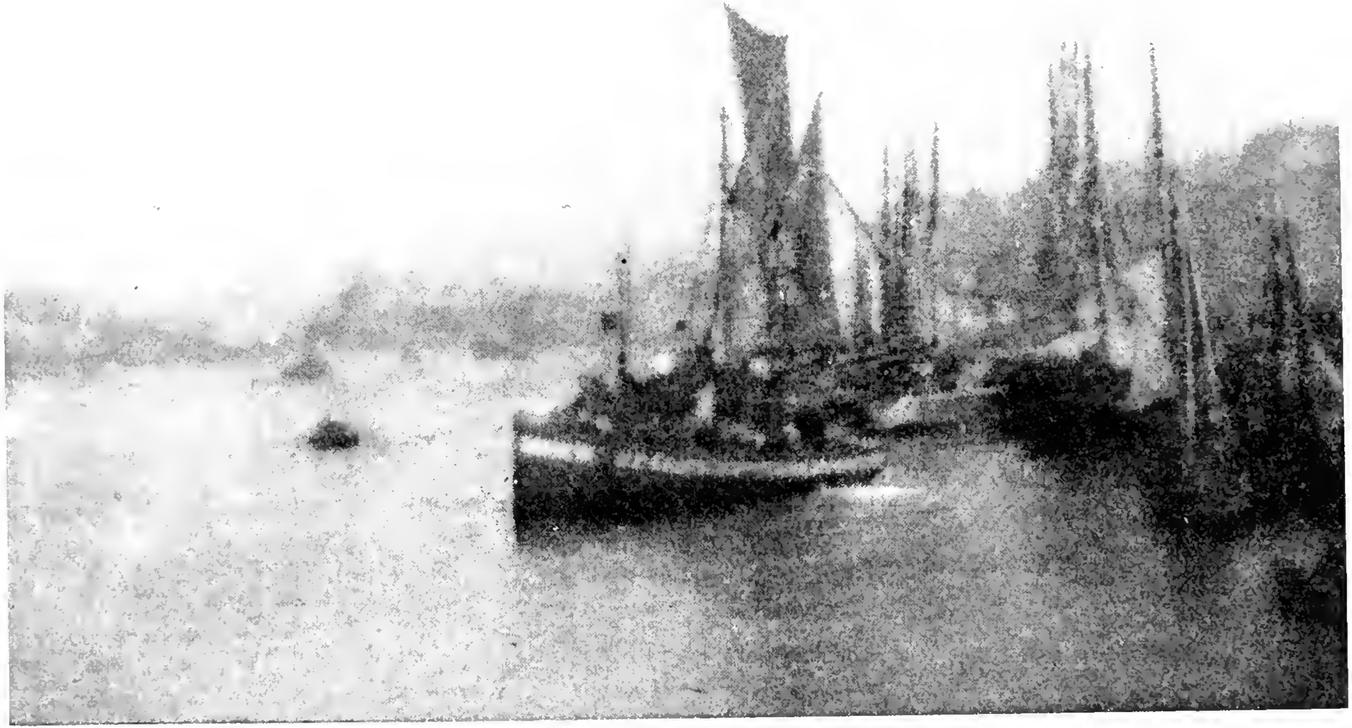
There are no books especially devoted to development papers available for English readers beyond the clever booklets offered, free on request, by the various manufacturers of these papers. These booklets are full of useful information and especially comprehensive in their handling of possible defects and remedies. The reader will consult at his convenience and profit by having all of them at hand for reference. No apology, therefore, is needed for giving here a few of the names and addresses of firms offering such helps: The Eastman Kodak Co., Rochester, N. Y. (for Velox and

Nepera papers); also Kodak Ltd., London (for Velox and Dekko papers); Artura Paper Co., Columbus, O. (for Artura papers); Defender Photo Supply Co., Rochester, N. Y., and Staley & Co., London (for Argo and Metalotype papers); Ansco Co., Binghamton, N. Y. (for Cyko papers); Kilborn Photo Paper Co., Cedar Rapids, Iowa (for Kruxo papers); Yunit Chemical Co., Rochester, N. Y. (for Yunox and Zona papers); J. L. Lewis, 379 Sixth Ave., New York, and Leto Photo Materials Co , London (for Leto papers); Wellington & Ward, Elstree, England, and Ralph Harris & Co., Boston, Mass. (for Wellington S. C. P. papers).

EDITORIAL NOTE

Our readers will be interested to know that Mr. Thomas Bedding, F.R.P.S., who has been associated with us in the editing of THE PHOTO-MINIATURE for the past few months, has taken charge of the experimental research department of The Cameraphone Company, of this city, one of the largest and most progressive houses in the moving-picture world. We wish him all success in his new post, for which he is exceptionally well equipped in technical knowledge and experience.

*** "Notes and Comments" and other departments are unavoidably left over for our next issue owing to the length of the monograph in this number.



Early Morning: Boulogne Harbour

Pastoral
A. Keith Dannatt
From the American Annual of Photography, 1909

The Photo-Miniature

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Photographic Post-cards

In an interesting paper recently read before the Society of Arts, the origin of the picture post-card was traced back to 1870, when a French stationer published such a card to commemorate the visit of a popular regiment to his city. The cards met with a large and successful sale, and the business possibilities of the idea quickly spread to Germany and Austria, in which countries the picture post-card was first put on a commercial basis and afterwards exploited throughout the world. Today, the production of picture post-cards is a flourishing industry, employing thousands of people here and in Great Britain, although the great bulk of the world's postcards still comes from continental Europe, with Germany as the center of their manufacture. The total annual output of picture post-cards can only be approximately estimated, but easily reaches into thousands of millions, more than 1,500,000,000 having been mailed in Germany, alone, in 1907. As the number mailed in America and Great Britain, combined, during the same period, cannot have been much less than this figure, we here get a glimpse of the phenomenal popularity of the picture post-card, as a means of friendly communication among the nations. This widespread popularity is reflected in the variety of subjects embraced by the picture post-card, which covers the whole range of human interests, appropriate for all seasons and places, with uses as widely varied as are human needs.

So much of familiar fact by way of introduction. In

this number of THE PHOTO-MINIATURE we are concerned with the photographic post-card rather than with the picture post-card of the shops. The world-wide exploiting of the picture post-card has forced the postal authorities everywhere to modify their regulations, so that we can send a photograph, with a word of personal greeting, all over the world at a nominal charge, in place of tedious letter-writing and a higher rate of postage. This possibility has opened up a new field of pleasure and profit for the photographer, offering a readily available outlet for his work. Apart from the pleasures involved in this, the photographic post-card offers possibilities of profit even to the individual worker with limited facilities, for there is always a market for cards of special or local interest, in circumstances where the commercial post-card does not enter or can have no place for one reason or another.

Subjects

Before taking up the technical details of methods and materials, let us look for a moment at the range of subjects available for photographic post-cards, as far as the amateur is concerned. The vital point here is that the amateur's post-cards, made to give pleasure to his friends or intimates, should be sharply differentiated from the commercial sorts by their personal associations or semi-intimate interest, shown in the choice of subjects and their treatment. Thus the subjects utilized will come, most largely, from among those things in which the maker's interest is shared by his friends.

Around Home

For example: who can question the interest of a series of home interiors by daylight, preferably showing a familiar figure or two, as the good wife at her piano or busied with her needle; or a similar series made at night, by flashlight and gaslight combined, showing the familiar aspect of the home when the lamps are lighted; or a series of home portraits with home accessories, such as the children with their toys, the master of the house with his dogs, the boys at their lessons, and so on? Around the house, especially if it be a suburban or country home, there are many post-card subjects which will give great meed of pleasure to those who may be

far away. For example, views of the house and its garden or tennis-court, its chicken-run, dog-kennels, stables and so on.

Local Associations

Then there are the local views. Not those made by the commercial people, whose photographer spent half a day in the village or about town; but the other views of the places near home which we ourselves know by oft-repeated walks and visits alone or with friends at different seasons of the year. The church and rectory, the local library, the brook and its winding path, the strip of woodland about twenty minutes' walk from the house, the big house on the hill, as we saw it with the sun behind it in October, the flower festival for the local hospital—all these subjects look quite different in our post-cards from those sent down to the local newsdealer and stamped "made in Germany." It is the personal touch which makes the difference, giving the photographic post-card, made at home, a value far above any commercial card.

Going farther afield, we have the subject of common interest enhanced by the individuality or personality of its maker. Thus, a charming bit of landscape or woodland and water, or a group of pet rabbits or dogs, a sunset scene or winter view, or a long line of happy children's faces over the tops of a low wall, or the congregation leaving church, the hundreds of merry children coming out of the school, the letter-carrier at the door, and so on; in all such subjects we have good post-card material, quite distinct from the cards sold in the shops because of their personal note.

Hobbies

Still wider is the field of subjects for those who have hobbies, and so can enter into the numerous post-card "exchanges" made up of workers who specialize or collect cards dealing with special lines of interest. Thus flowers, fruit and trees, ferns and grasses, sea-weeds, cats and poultry, butterflies and birds, geographical or nature subjects, sea pictures, frost and snow crystals, local or national types and costumes, places of literary or historical association, etc., all offer interesting subjects for the post-card enthusiast.

Travel Similarly, for those who travel, the argument for individuality applies with equal force as in the instances given. There is no denying the fact that our own personal impression of Washington, or New York, London, Venice or Norway, as sent home on post-cards made as we journey, will be kept and valued by our friends, the stay-at-homes, long after the commercial post-cards, which marked the trip, are discarded and forgotten. It is the personal note that tells.

Old Memories Finally, we have hundreds of post-card subjects all ready to our hands among the negatives on our shelves; happy reminders of places and scenes in which we had pleasure with our friends a year or ten years ago. Hunt them out from the forgotten piles and make post-cards from them; then you will see how much pleasure there is in the revival of old memories.

Making It Pay When we consider subjects from the viewpoint of profit, we take another and a different view of the post-card. It may be that we are amateurs willing to make pocket money with the camera; or we may be professionals seeking to add a side line of attractive post-cards for sale or advertisement. Here we look at subjects from the selling point of view. The vital thing is to select subjects which are not hackneyed or overdone; to get something which cannot be had in the shops or seen at the news-stand postal display. If we make post-cards of local views, they must differ from the commercial sort in the point of view chosen, or in the method of treatment. Thus a view of the church will always sell better if a small portrait of the pastor is "inserted" at a corner; or a familiar town scene may be made to seem different by being taken at sundown with sky effects, or by night, or under a covering of snow. Similarly, we may find a good subject in six puppies placed in a row, or a few kittens at play, or a troupe of performing dogs, and so on. In this field success depends on novelty and distinctiveness; there is room for endless ingenuity and the use of imagination or "mother wit." One success will amply repay the labor of a dozen failures.

Printing Processes

The processes employed in making photographic post-cards are, of course, the every-day printing methods with which the reader is already familiar, viz.: blue-print, sepia, kallitype, plain silver, print-out (gelatino and collodio-chloride), bromide and development (gaslight) emulsions, platinum and carbon. Of these, blue-print, sepia, bromide, print-out (ordinary and self-toning), and "gaslight" post-cards are commercially obtainable at most photographic supply stores. Platinum post-cards are not now listed in this country as far as I can discover, though two or three British makers still offer them. I find no mention anywhere of carbon supplies for post-cards, although this process is as well adapted as any other for the purpose, with the added advantage of a wide range in color variety. Those who want plain silver or kallitype cards must perforce prepare them for their own use. More than nine-tenths of the photographic post-cards produced are made on commercial, ready sensitized cards, most largely of the "gaslight" class, and, beyond a doubt, the use of commercial cards is more convenient and much more economical than the attempt to manufacture them for oneself on a small scale.

Home-Made Cards

Nevertheless, those who desire for any reason to prepare and sensitize their own cards, will find formulæ and methods easily adaptable for this purpose in earlier issues of THE PHOTO-MINIATURE, as follows: plain silver methods in No. 21; kallitype methods in Nos. 47, 69 and 81; print-out methods in No. 69; bromide emulsion method in No. 75; blue print and sepia methods in No. 81.

Card Stock

One of the chief difficulties in the home preparation of post-cards, is the finding of suitable card stock. This must be absolutely pure for photographic sensitizing, clear and bright in color, and sufficiently tough to withstand the frequent wetting and handling to which it is subjected. Firms who make papers especially for photographic use, such as the Mittineague Paper Co., Mittineague, Mass., could probably supply such cards to order. This firm's Strathmore water-color paper, obtainable in sheets from any artists' supply store, is

very suitable for rough-surfaced cards. Whatman and Arnold's hand-made heavy drawing-papers are also adapted for post-card work where cost is not the chief factor. The stock chosen should be cut to the official size, 3½ x 5½ inches, and the front side imprinted according to the postal regulations before use. For this it will be sufficient to follow the style of any recently issued picture post-card. The printer to whom this work is given should be instructed to avoid handling the back surfaces of the cards as much as possible, as any greasy or perspiration marks will offer difficulties in the sensitizing of the cards. To this end, many amateurs who make their own cards imprint the fronts with a rubber stamp outfit made for the purpose, doing the work after the cards are finished. This cannot be commended.

Commercial Cards

Undoubtedly the most convenient method of printing post-cards is the use of commercial gaslight or development emulsion cards. These are readily obtainable in a wide range of varieties, permit one to print at night or by artificial light with all its advantages, are simple in manipulation and altogether satisfactory in results when handled with ordinary care and intelligence. As gaslight cards are more generally used at present than any other sort, we may profitably take them first in a brief survey of the commercial cards available.

Velox

Almost all manufacturers of gaslight papers offers two or three grades or varieties of gaslight post-cards. Thus, we have Velox post-cards as follows: Velvet, Regular and Special; Special Portrait; Special Rough Surface; Glossy, Regular and Special, and Special and Regular Royal, these last offering a card with a cream-tinted base, suited for sepia tones by redevelopment. In addition to these, which are furnished in the regular size, 3½ x 5½ inches, we have Velox double post-cards 3½ x 11 inches, furnished in Velvet, Special and Regular; Portrait (Special) and Rough (Special); also Brownie post-cards.

Cyko

Cyko post-cards are made in three surfaces: Normal Grade:—Glossy, Semi-matt and Studio (velvet); also in Professional Grade: (glossy, semi-matt and studio), and

three sizes, viz.: $3\frac{1}{2}$ x $5\frac{1}{2}$, $3\frac{1}{2}$ x 11, and $3\frac{1}{2}$ x 12 inches.

Argo As with Argo development papers, so with Argo post-cards; there are so many grades and varieties that the list here given may be incomplete, as I have no official data at hand. From use, however, I can mention: Argo Portrait Glossy, Matt and Velours, for soft effects and for intense or contrasty negatives (Regular and Special grades); and Portrait Argo Rapid, Glossy, Matt and Velours, for soft effects. Doubtless there are other varieties.

Artura There are three distinct varieties of Artura post-cards, viz.: Non-curling, Carbon Black (rapid), and Carbon Green (slow), all made in half-matt surface only.

Kruxo The makers of Kruxo paper offer two varieties in post-cards, viz.: Kruxo cards, non-curling, with three surfaces: Semi-matt, dead-matt, and glossy; and Acme-Kruxo, especially adapted for portraiture and soft effects, in two surfaces: Semi-matt and dead-matt. Acme-Kruxo possesses a remarkable degree of latitude in adaptability to different classes of negatives.

Yunox Five grades of Yunox post-cards are now available, viz.: Velvet (soft and contrasty); Carbon (soft and contrasty); and Glossy (contrasty). In addition we have a new card, Yunox Art Rough (for soft effects), very pleasing for some subjects; and Zona cards, semi-matt (soft and contrasty) recently introduced.

British Cards The list of gaslight post-cards offered by British makers is too lengthy for any description here. Briefly, the chief varieties are Ilford, Leto, Barnet, Wellington & Ward S. C. P., Paget, Imperial, Zigo, Rajar and Morgan and Kidd. These include every possible variety of surface finish and grade.

Manipulation The printing of gaslight post-cards does not differ in any detail from the methods employed with gaslight papers, each maker's product giving the best results when handled according to the official instructions and formulæ

issued with the cards. To discuss these here would practically result in a republication of the last number of THE PHOTO-MINIATURE, to which the user of gaslight post-cards is referred as to special methods and formulæ. With post-cards, where the picture may be of any desired size or shape within the limits of the card, usually $3\frac{1}{2}$ x $5\frac{1}{2}$, the use of mats and borders is the chief difference between making prints on paper and making prints on post-cards. This difference will be fully dealt with in later pages of the present issue.

Print out Cards

Perhaps the most popular print-out cards used in this country are those known as "self-toning" post-cards. These have the gold or toning agent incorporated with the print-out emulsion and, after being printed, are simply fixed in hypo and washed. The best-known post-cards of this class are Aristo Gold cards and Seltona post-cards. Aristo Gold post-cards are made in one grade only, with a velvet or soft-matt surface. Used according to the method advised by the manufacturers, they give very pleasing prints of a purple-brown tone, brilliant and full of detail. Seltona post-cards are made in three grades: matt-smooth, cream smooth and glossy mauve; also in the "Tintona" series, in five colors, viz., blue, green, steel-gray, cream and dove-gray. Used with discrimination as to subject and choice of color-base, this Tintona series offers many advantages.

Bromide Cards

These, in America, are offered only by the Eastman Kodak Company (P. M. C.) and the Defender Photo Supply Company (Monox). In Britain a much wider variety is available. They are handled in every respect like bromide paper and, similarly, lend themselves to toning by the bromide-toning methods now so much in vogue.

Blue-print Cards

The simple blue-print process is one much used by amateur post-card enthusiasts, the ready-sensitized cards being offered by many different makers, the Kodak and Defender's blue-print cards deserving special mention. Sepia post-cards are offered by the Eastman Kodak Company, only which firm offers the only print-out post-card, viz., the Solio card.

Mrs. E. P. Cabot

From the American Annual of Photography, 1909

The Fountain
Mathilde Weil

Preparing for Printing

Presuming that the reader has chosen the particular printing process suited to his taste and convenience, and that he has at hand a supply of sensitized cards, with a few negatives of subjects adapted for our purpose, we can now consider the preparations for post-card printing. These are identical with all sorts of cards up to the actual operation of printing, except, of course, that gaslight post-cards should be carefully handled in very weak daylight or gaslight, and bromide post-cards in a safe yellow or red light.

Printing-Frame

As our negatives may be larger or smaller than the post-card size, 3½x5½ inches, and it may often be desirable or necessary to have the picture occupy only part of the space available on the card, the first requisite is a printing-frame which will allow ample space for any desired adjustment of the card on the negative in use. This is simply a question of size: a half-plate, 5 x 7, 6½ x 8½, or 8 x 10 frame will meet all our requirements. There are in the market several printing-frames specially designed for the convenience of the post-card maker. They offer conveniences, but are not necessary.

Masks or Cut-outs

Further, for all styles of printing except the plain printing of a picture of the full size of the card, we will need a variety of opaque paper masks with cut-out openings of many shapes and sizes. These may be purchased ready for use in packages of assorted sizes and shapes, but more often than otherwise it will be found desirable to make our own masks for special conditions and subjects. For this we will need a small supply of black needle paper, or any other thin, opaque paper which, when cut, will give us a clean sharp edge; a sharp knife or print-trimmer, a brass-edged rule, a piece of glass for a cutting-board, and a revolving trimmer such as is sold for trimming oval or circular prints.

Large Negatives

When the negative in use is larger than the post-card and the picture is intended to cover the whole of the card to its edges, we have the simplest form of post-card printing. All we need here is to place the post-card,

sensitized face down, on that portion of the negative which will give us what we want on the card, and print as usual according to the process employed. For example: If we have a 5 x 7 negative of a woodland scene with a path or stream running through the view, we first make a full-sized print from the negative. On this we carefully mark a rectangular space 3½ x 5½, which encloses that portion of the view which we want on the post-card. Now, with a ruler and sharp knife we cut this portion out of the print, thus forming a mask. Laying this mask on the negative in the printing-frame, we have the desired portion of the negative in a recessed space into which the sensitized card neatly fits. This ensures our getting exactly the same portion of the subject on all the cards printed and is a practical help in placing the cards on the negative. By remaking the mask with *thin* cardboard, the work is made still simpler and more certain.

Borders

When we desire a narrow white border or margin around the print, this thin card mask should be laid on a piece of opaque or black paper and the opening marked with a finely pointed pencil. Now, rule lines within the pencil marks, say one-eighth inch within, so as to form a smaller rectangular space with its sides and ends truly parallel. Cut this portion out with a sharp knife, and we have an opaque mask with an opening about 3¼ x 5¼ inches. Place the negative in the printing-frame as usual, on it lay the black mask, and on this place the thin card mask into which the sensitized card is placed for printing. This will give us a post-card with the picture occupying the whole of the back of the card, except for a neat white margin around the print. It is obvious that this margin can be made of any desired width, at will, by cutting the mask further within the size of the thin card mask, and that by using a semi-opaque under-mask, we can get borders or margins in tones of varying depth.

Small Negatives

In working with negatives smaller than the post-card size, the same principles are followed. Here we need, first, a piece of perfectly clean glass in the printing-frame to support

the smaller negative. To this the small negative, whether of glass or film, can be lightly attached by gummed strips or, better still, by cutting an opening the size of the negative in a thin card which fills the printing-frame. In this way the negative is securely held during all the operations, the position of the recess or opening for the negative in the card being chosen according to the working-space necessary to get the picture in its proper position on the post-card. In this way, by the use of suitable masks any portion of a small negative can be printed in any desired position on the post-card. The opaque mask, of course, should always be as large as or larger than the post-card, so that all the sensitized card is protected during printing except the portion giving the picture desired.

Where Skill Begins

Many methods of masking, bordering, vignetting and combining prints in post-card printing are given in the following pages. With a little practice along the lines here suggested, the reader will quickly master the few points of manipulation essential to successful work. The actual printing of post-cards is, in itself, extremely simple, and calls only for ordinary care in following the instructions laid down by the manufacturer whose products are used. It is in the preparation for printing, the choice of the subject, the selection of the most pleasing portion of a larger negative, the cutting of suitable masks and the correct placing of the print on the card, where one's skill and individuality can be shown. Each class of subject will be seen to lend itself to individual treatment; one will look best as a long panel, another as a vignette, a third will be enhanced by bordering, another needs decorative effects to be added, and so on.

Printing

In the actual printing of post-cards the reader will follow the ordinary procedure advised for the particular variety of card employed. First, in order of simplicity, come blue-print, sepia, and self-toning print-out cards. These require daylight and preferably sunlight. Next, come gaslight cards, which may be had in endless variety for all sorts of negatives and subjects, and can be handled most advantageously in gaslight or other convenient artificial

light. The operations are few and call for very little time: exposure (a few seconds), development and fixing. By this process a hundred post-cards after supper is entirely practicable. After these we have the print-out cards which call for daylight time, several washings, toning and fixing, usually more than the majority of amateurs can give. Finally, we have the bromide cards, made chiefly for professional workers who produce cards in large quantities. These require very little time for their production, but the equipment must include a darkroom, with safelight for manipulation and a convenient light for systematic and uniform exposure, development, clearing and fixing baths.

System

If the reader desires, for any reason, to produce post-cards in quantities of over a hundred at frequent intervals, as may be the case with many amateurs, the manipulative part of the work should be carefully systematized. In this work the negatives are classified according to their printing qualities and characteristics; they are next prepared for printing, masked, etc., so that they can be handled quickly; the exposures are all put through at one time under uniform conditions, each class being handled together; a post-card printing machine is used to simplify exposure; the exposed cards are developed all at one time by one worker and passed to an assistant for fixing and washing. In this way every moment of time is utilized and as many as seven hundred cards can be finished within a few hours.

Printing Machines

Several varieties of post-card printing machines are available for those who work on a large scale. To describe these in detail would occupy more space than can be given here, but the interested reader can readily investigate the different models by writing for descriptive literature to the following makers: Artura Paper Co., Columbus, Ohio; Kilborn Photo Paper Co., Cedar Rapids, Iowa; Burke & James, Chicago; H. Remiers, Milwaukee. The Courtright Photo Printing Machine Co., Fort Madison, Iowa; and the Vote-Berger Co., LaCrosse, Wis. Most of these use electric light as the illuminant in exposure, and are priced at from $10 to $50 or more. They are

intended for the making of development prints of any size from post-cards to 11 x 14 inches and undoubtedly offer great convenience and economy where large quantities of cards or prints are to be produced in a short time or at a low cost.

Printing with Magnesium The following method, suggested by W. H. Zerbe, for printing gaslight post-cards with magnesium ribbon, will be found as economical as it is practical where quantities of post-cards are needed from one or two negatives. Once the correct exposure for any given negative and sensitized card has been ascertained, this method makes the production of a hundred post-cards after supper a reasonable certainty. Mr. Zerbe writes: A short while ago I had occasion to make a large number of post-cards on gaslight paper. The negative I was using took about fifty seconds to print by a Welsbach burner. With 300 cards to make and with the time at my disposal, I saw that I should have to do something if I wanted to get the cards out on time. Daylight being out of the question, as I could not get away from business, I remembered the many purposes for which I had used magnesium ribbon; I thought, why not try that? Accordingly an exposure was made using a piece of ribbon about three-quarters of an inch long. The result was a correct exposure in two seconds. Here was the solution to get out my cards in time, and I at once rigged up a temporary affair to print more handily. I have since fitted up a more substantial outfit which has given me perfect satisfaction, and I give it here for the benefit of those who may be placed in the position that I was in, or to use as I do now, for all my gaslight printing.

I will try to explain the apparatus by the aid of the sketch. The materials are all at hand with perhaps the exception of the piece of ground-glass. (See Fig. 1 on following page.) *A* is an ordinary table, in the absence of which any board or shelf will do; *B* is a block of wood about eight inches square, thickness immaterial, with a stick about one inch square which is screwed to the board from the bottom (the height of this stick will depend on the size of printing frame used); near top of this stick bore a hole to receive a metal tube. I find the

handle of a mucilage brush answers very well, cut off the brush part, and open the other end. *C* is also a board of a convenient thickness, and must be as wide as the piece of ground-glass to be used. On this board nail two strips leaving a space or groove the thickness of the ground-glass; this is simply a holder for the glass. *D* is the printing frame set on anything to bring it central with the ground-glass and tube which holds the ribbon. The frame, ground-glass and light must be central. The ground-glass is used simply to diffuse the light, and

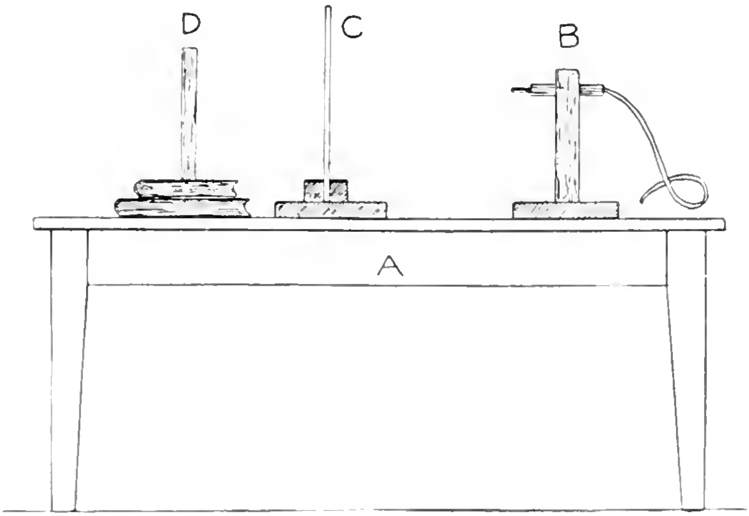

Fig. 1

lengthen the exposure, as the ribbon about a half-inch long is apt to over expose a print from a thin negative, and I find that this amount is the shortest piece that can be conveniently used. I would suggest that a piece of ground-glass about 10x12 inches be used. I find that I get even illumination by having the negative six inches away from the ground-glass and the light about twelve inches away.

When ready to print cut off three or four feet of the ribbon and run it through the tube, letting it come through as far as has been determined to be the right length to give the correct exposure. Keep a lighted candle at hand and when the printing frame with negative and paper is placed in position use the candle to

light the ribbon, which will burn only that portion that projects through the tube. Once you have determined the amount of ribbon to be used you can repeat these operations until all the exposures are made leaving the development of the cards for any more convenient time. Magnesium ribbon can be bought from any dealer at about 75 cents per roll. Under ordinary conditions a roll of ribbon will serve the amateur's needs for a year or two. Those who have occasion to make post-cards in quantities will find in this method a considerable saving of time and gas bills.

Titling Negatives

The reader who makes post-cards in small quantities from many negatives for personal pleasure will have little or no use for formally printed titles or lettering, preferring a written title or initial on the card itself. But when a large number of prints are made from a negative, such

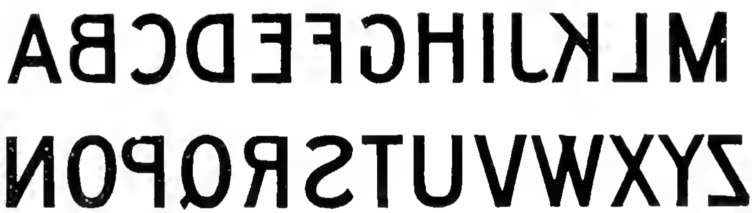

FIG. 2

as an interior of a church or hall or a portrait for sale at church fairs, etc., the cards should be properly titled. If this title is impressed on the negative once and for all, it will print with the rest of the picture, and the trouble of titling each individual card will be avoided. There are two ways of titling negatives for this purpose: (1) Writing or printing the title on the negative with pen and India ink, and (2) the use of a printed title on transparent paper which is gummed, face down, on the film side of the negative, or the use of a commercial rubber stamp outfit made for this use such as "Titleit" or "Nameit." These outfits consist of a supply of non-actinic colored ink and a set of reversed rubber types.

Many photographers who have attempted the hand-printing of titles on negatives think this to be a tedious and difficult operation. It is really very simple after

one has had a little practice in handling reversed letters and printing familiar names from right to left instead of the usual way. As a guide in this practice the following alphabet may prove useful. (Fig. 2 on page 439.)

In the actual titling of a negative for post-card work, of course, the lettering should be much smaller than is here shown. It should be done with India ink (such as Higgins' Waterproof Black or Winsor and Newton's Nigrine and a finely pointed, clean steel pen, on the film side of the negative, the letters, as indicated being reversed and printed from right to left. When the negative is turned round and viewed from the front or glass side, the title will read correctly as in the print. Decorative lines or ornaments are added in the same way.

Mats and Masks

The post-cards of the shops are usually printed full size, i. e., the picture occupies the whole of the card to its four edges; or they are embellished with elaborate and conventional designs. The individual worker can give his post-cards a note of distinctiveness and character by varying this monotony and printing his subjects upon a portion of the card, leaving the rest clear for a word of greeting, or by the use of mats giving a simple, but tasteful, decorative designs. In fact, once we depart from the commercial method of printing views in full size on the post-card, we have an extensive and interesting field for the expression of individual taste and fancy.

The simplest and most desirable mat for general use is one which will give a neat white border around three sides of the subject, and a larger space beneath the picture for title or personal greeting. The making of such a mat is described, as follows, by Henry C. Delery.

Mats or masks of different shapes or sizes, appropriate to the style of the picture, are employed. These, I find, unless properly prepared, are the source of much trouble, especially in centring the picture on the card, or printing it so that there will be equal and straight margins on all sides. Owing to the nature of the cards it is impossible to centre the picture by looking through it against the light, as can be done with thin paper, and unless some means are employed the setting of the mask becomes mere guess work.

To obviate these troubles, I have devised a very simple mask, in which the placing of the picture in its proper position is a certainty at all times, and is very readily adjusted. The mat must be made of some opaque paper; needle-black or yellow post-office paper, if of sufficient opacity, will answer the purpose admirably. The cut-out of whatever shape desired is first drawn upon the paper, and then the exact size of the post-card to be used is laid out round it, so that a suitable margin is obtained. These lines indicating the post-card are then drawn very thick with black ink, or white

FIG. 3

if the needle-black paper is used, after which the mat is cut first the opening for the picture to print through, and then the sides a short distance from the lines of the post-card, so as to leave a sufficient margin; this is shown in accompanying illustration. When ready to print, the mat is simply placed on the negative over that portion of the view which is selected, and held in a position with the thumb placed on the margin. The post-card may be adjusted so that the edges will coincide with the lines drawn on the mat, and we can rest assured that the resulting picture will be straight and true and well centred on the post-card. (Fig. 3.) The width of the margins is variable at will.

Tinted Borders

A simple and effective method of printing small negatives or portions of negatives on post-cards with tinted borders is described as follows by T. E. Oakes. It has the advantage of being applicable to any printing method, and permits of any reasonable number and disposition of borders. If the masks are cut correctly, it is impossible to get the prints out of register except by absolute carelessness. The example here illustrated in diagrams will give a print 2½ x 4 inches, with a narrow white margin around the print, enclosed by a light tint, which

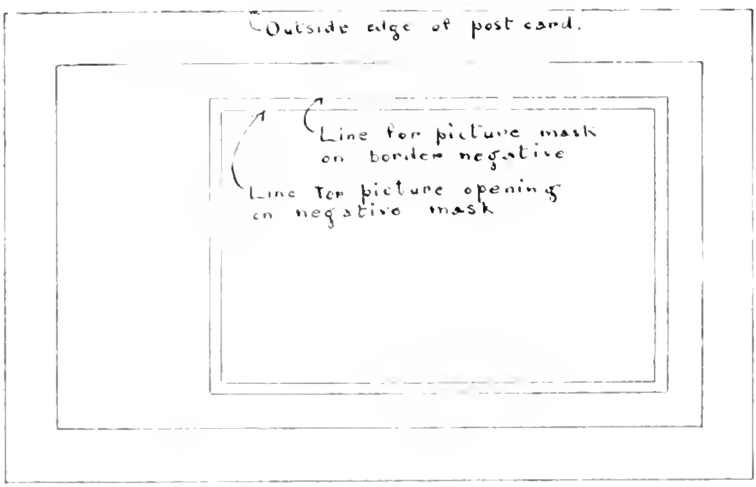

FIG. 4

is surrounded by a wider and darker tint extending to the edges of the card.

First, mark out the size of post-card, generally five and three-eighths inches by three and a half inches, on a piece of paper, and inside this, in the position required, the size of picture it is proposed to print, and then the borders, as Fig. 4. This is best done by means of T square and set square, with the paper pinned down to a drawing-board; but in any case it must be done accurately. Mark the top and right-hand corner.

From this drawing make two tracings on ordinary tracing paper, taking care not to cross the lines at the corners, and not forgetting to mark the same corners.

The Magazine
Henry Hall

The Miniature
Curtis Bell

Now get a clean half plate or 5 x 7 glass and fasten one of the tracings down on it with small dots of Seccotine, Taurine or any other strong adhesive except paste (which causes the paper to expand), taking care that none of the dots come under the shaded part which, when printed, forms one border. (Fig. 5.) When dry, cut out the part marked clear glass with a sharp knife and flat ruler; then cover the center part (line for mask) with a piece of black paper, cut exactly to size. This now forms the negative for printing the borders. It will be noticed that the black paper center is slightly larger all round than the size of picture, as it forms the narrow

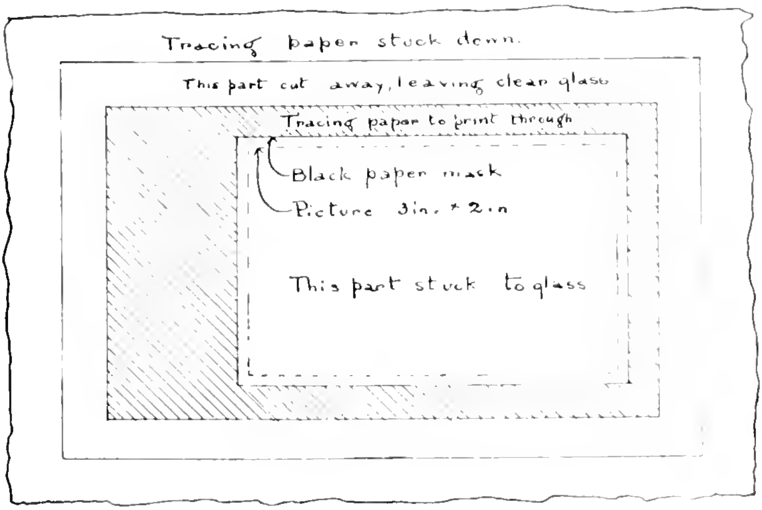

FIG. 5

white border, in addition to masking the picture part while the tinted borders are printing.

Now take the remaining tracing, and stick it down to a piece of black paper with "Seccotine" as before (paste causes the paper to expand), and cut out the small opening by line for picture, Fig. 4, and also round the outside line of card. This forms the mask for border part while the picture is printing, and may, of course, be put over any part of the negative. The latter is conveniently held in position by a piece of cardboard, half-plate size, in which an opening has been cut for it, and

the mask may be attached to the card with stamp edging. If the negative is a film, the mask would be stuck on to it direct.

To print, use two half-plate frames, one containing a clean glass, on which you place the negative with the cardboard and black paper mask attached, and the other containing the border negative. First fit one side and one corner of the card to be printed exactly to the long side and marked corner of the black mask, and then print the picture. Now take the card out of that frame, and fit the *same* side and corner to the marked sides of the border negative, and print that also. Then develop, and if the masks have been carefully cut, the two will register exactly.

A very short exposure only is required for the borders, roughly from three to fifteen seconds, at seven inches from gas burner, for "gaslight" papers, according to the depth of tint required and variety of paper. With platinum post-cards a trial or two with the masks alone will quickly tell the amount of exposure required to get tints of the depth usually desired, and the printing of the picture may be judged as in ordinary platinum printing. In the use of print-out post-cards, of course, the printing is visible and can be absolutely controlled.

The title of the picture, if a large number of prints are desired, can be printed in India ink on the underside of the tracing paper border and will print in white letters. Where small quantities of prints are desired, however, it is better to put the titles on the cards themselves when finished, so that the marks may be utilized with any other negatives for which they are suitable.

Borders by Single Printing

This method is given by J. Peat Millar and has proved practical in the writer's hands. A film negative is cut to the exact size desired for the picture on the post-card. Several pieces of white, translucent paper are next cut to the size of the post-card and openings cut in these, some slightly smaller and some slightly larger than the film negative. If now we place one of these mats (the one with the opening smaller than the negative) on a piece of clean glass in a printing-frame, center the negative

over the opening, put in the sensitized post-card and print as usual, according to the method preferred, we get a print with a narrow white border surrounded by a wider border of light or dark tint according to the thickness or opacity of the paper mask. If we use a mask having an opening slightly larger than the film negative, and proceed as outlined above, we get a picture with a narrow dark border surrounded by a wider border of lighter tint—all by one exposure or printing. The effect obtained resembles a print mounted on a natural tint mount and is very pleasing. The depth of tint obtained in the border is, of course, variable according to the translucency of the paper mask employed and the density of the negative, since print and border have to be secured in one operation.

It is obvious that those with the skill required can introduce flat tints of color, line decorations and the like on the paper mats and so produce varied effects in the border. Similarly, the use of thin papers bearing litho or tint designs, such as are used for book "end papers," offers many advantages in this method.

"Plate-sunk" Cards

With certain classes of subjects and rough-surfaced post-cards the "plate-sunk" effect, which imitates the mark made by the engraver plate in the pulling of an engraving, adds to the finish of the card. An experienced post-card worker, J. H. Crabtree, describes the following method for the home-preparation of such cards:

First mask the card; that is, in printing from the negative place a mask (round, oval, oblong, cushioned or other, just as you desire) between the negative and the card. Print as usual, and let the card be perfectly dry before plate-sinking. Remember that the "sinking" line should be outside the picture and not on it; hence the necessity for masking. Now, take a piece of cardboard about 8 x 6 inches and $\frac{1}{10}$ of an inch in thickness, and mark on it the shape of the indent which best suits the picture. This shape is to be carefully cut out of the cardboard, keeping the edge as uniform as possible. If a circular indent is required, use a circular cutter, or cut with a sharp knife round the edge of a circular form of the right size. If an oblong indent is desired, cut out

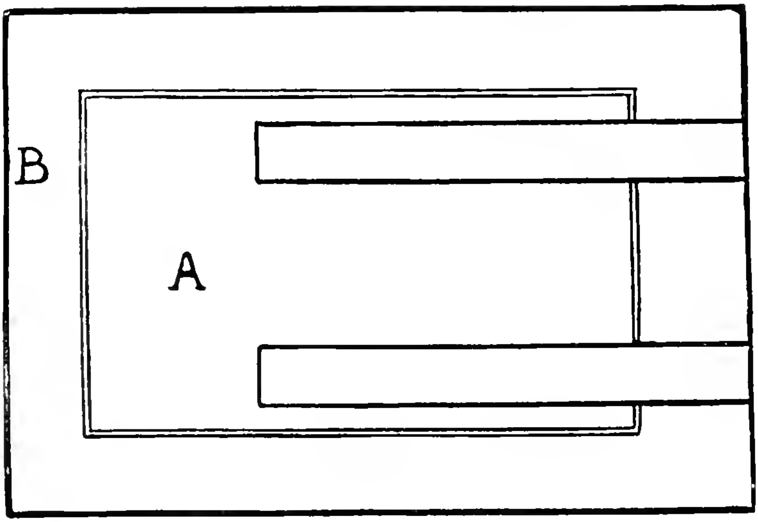

FIG. 6

the shape, of any length and breadth, with a knife and a flat rule, or glass cutting-shape.

You have now the aperture in the cardboard mask; cut another piece of card of the same thickness to serve as a mat, fitting easily, not tightly, in the aperture just mentioned.

Referring to Fig. 6 you will see the mat *A* fitted in the mask *B*. Two strong pieces of gummed cloth are attached to the upper side of the mat *A*, as seen, and to the under side of the mask *B*, but this cloth is quite free from the upper part of *B*. As the post-card is to be put on *B*, the reason for these attachments will be clear.

Place the printed card *C* on *B*, as shown in Fig. 7, turning the mat *A* back for the purpose. Then bring

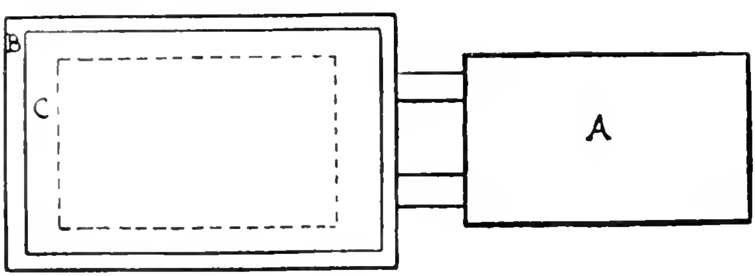

FIG. 7

back the mat *A* on to the picture-surface of the card. The mat will be immediately over the aperture in *B*, and fair pressure is now necessary to complete the process. This pressure may be applied by smartly forcing down on the mat the hard, flat cover of a book; a better method still is to place the three cards—mask, post-card and mat—under an ordinary screw-press; a beautifully regular indent is thus made in one minute.

It will be obvious that with this simple cardboard appliance indents of any shape or size may be sunk, and these may be made on any part of the card, centrally near the top or bottom, or in any corner.

For plate-raising, the process is precisely similar with the post-card placed in the mask *B*, picture side downward.

For bringing striking subjects into increased prominence, the plate-raised card answers splendidly.

Vignetted Cards

The vignetted photograph has largely gone out of fashion since we began to talk so much about photography as one of the fine arts. It was considered "inartistic." Some critics went further and said it was "atrocious." However that may be, the vignette gave pleasure to all the world and his wife until a few years ago, and there can be no question about its suitability for post-card work Who can reasonably object to a softly vignetted head of a child, or a spray of apple blossoms, or a carefully chosen bit of winter landscape delicately suggested in soft gray tones on a card of greeting or remembrance? And those who have skill in tinting or suggesting color in the photograph or sketch will find in the vignette just the basis required in this work.

No special apparatus is needed except a vignetter. There are many forms on the market, such as the popular "Dixie," which can be purchased from any dealer for a few cents. The reader who knows nothing of vignetting should begin with the commercial article as a matter of demonstration, after which he will quickly learn to make his own vignetting devices for his particular uses, the commercial forms being generally adapted for portraiture.

A vignetter is simply a piece of cardboard large

enough to cover the front of the printing-frame, to which it is attached with a couple of tacks or screws. In this card an opening is cut, slightly smaller than and generally conforming in outline to the portion of the negative from which the vignette is desired. Thus a vignetter for a bust portrait will have a pear-shaped opening slightly smaller than the outlines of the head and shoulders of the subject as seen in the negative. This opening has serrated edges—saw-like teeth cut to a depth of half an inch all the way round—and is covered with two or three thicknesses of tissue paper, to soften and graduate the light falling on the portion of the negative to be printed. If the wooden sides of the printing-frame are built up with strips of wood, so that the vignetter is separated by an inch of space from the negative, so much the better, but the opening in the card should be smaller in proportion as the vignetter is separated from the negative.

To make a vignette put the negative in the printing-frame and adjust the vignetter to the front of the frame so that the opening (on looking through) just encloses the portion of the subject to be vignetted. Place on the negative a post-card so that the vignette will be printed in the desired position on the card and print as usual — but in soft, diffused light. Good vignettes cannot be made in sunlight or any direct, concentrated light. If print-out post-cards are used, such as Aristo gold, or Seltona, or blue-print or sepia cards, the progress of printing and vignetting can be watched by examination, and the success of the vignette depends simply on the size of the vignetter opening and its adjustment over the negative for the result desired.

Gaslight Vignettes

For the production of vignettes on gaslight or development post-cards many methods and special devices have been suggested, as if the work involved peculiar difficulties. But I cannot see the need for these special methods. In my own practice I adjust the vignetter to the negative and put in the sensitive post-card as usual, working in weak daylight or gaslight as the case may be. In diffused daylight, such as that given at a north window on a dull day, an exposure of 10 or 12 seconds

is sufficient for the average negative and a vignetter covered with two thicknesses of tissue paper. The correct exposure varies, of course, with the rapidity of the paper emulsion, the character of the negative and so on, but can readily be ascertained by a trial print or two. If the light is bright, keep the frame moving during exposure to ensure a soft and evenly graduated vignette.

In vignetting by artificial light, such as gas or incandescent electric, the printing or exposure is apt to be slow because of the tissues over the negatives, but an exposure of five to eight minutes at 12 inches from an incandescent Welsbach light is sufficient for the average negative. In this case, since we are working with a strong direct light, it is essential to keep the printing-frame moving during the whole of the exposure to prevent abrupt shading of the vignette. The motion should be circular with a comparatively small area and to and from the light. This will give a softly shaded or gradated vignette effect. The method is as simple as ordinary gaslight printing, plus the use of a vignetter.

By using a printing-frame larger than the negative to be printed from, such as a 5 x 7 frame for a $3\frac{1}{4}$ x $4\frac{1}{4}$ negative, it is possible to adjust the vignetter opening and negative as well as the position of the post-card on the negative, so as to vignette any desired portion of the subject in any required position on the post-card. When the reader has acquired a little skill in handling the vignetter, he will perceive that the shape of the opening and the amount of light diffusion had can be varied at will to meet the requirements of any negative or subject.

Right in line with the principles of vignetting, the modification of the negative during exposure should be mentioned. Thus the interposition of any opaque object, such as the fingers or hand, between the negative and the light will shield any desired part of the negative from light action. The object interposed should always be kept in gentle motion during exposure. In this way with a piece of card in the hand we can remedy the thin portion of a negative, or a defective corner, or a heavily shaded portion of the subject lacking in detail, softening or diminishing the action of light thereon so as to avoid dark corners or shadows in the print.

Composite cards

A very attractive and satisfactory post-card for many uses, and one which has the desirable note of difference from the average commercial card, is the composite post-card, which includes three or four small views or portraits tastefully grouped or connected by design. Such a card offers abundant scope for individual taste and fancy in its production and the obvious advantage of the series idea enhances its value to the recipient. It may include a series of views in and about a suburban or town house, a favorite church, the public buildings of the city, home portraits of one's family or a child at play and so on without end.

To make such cards some little skill in copying is desirable, but this offers no serious difficulty to the amateur photographer. The views or series of portraits to be used are carefully selected and prints are made on glossy gaslight or print-out paper. Good prints are essential, with brilliancy of detail and shadows. With a supply of these at hand we next require a sheet of stiff cardboard, gray or slightly tinted, and of such size and shape that it will conveniently reduce to the usual post-card size of $3\frac{1}{2}x5\frac{1}{2}$ inches. The three, four or five points selected to form a series are now arranged for effect and grouping on this large mount and each print is cut and trimmed to such a shape as most advantageously combines with it fellows in the series. Their final positions are marked and they are carefully mounted in their places. This done, a line of white or pearl-gray water color may be run around each print so as to bind or connect the series, and titles are printed or written beneath each print. In this there is room for all the skill in decorative design which the individual worker may possess. Simplicity is best; over elaboration should be avoided.

When so finished, the large card with its grouped series is photographed down to the required size. In this it will be found of practical advantage to rule the exact size of a post-card on the ground-glass of the camera. In focusing, aim for definition, using the largest stop permissible with this condition. Slow plates are generally preferred in work of this kind as offering greater

latitude and control in working, with a long range of gradation. The exposure, of course, will vary with the conditions of light lens, plate, and the amount of reduction, but three minutes in a fairly lighted room, using stop *f*/32 in the lens, may be taken as an average exposure.

Cards of this kind are more effective with three than with five views, the latter arrangement reducing the size of the pictures considerably. As a rule the little views should be one and three-quarter inches wide. In the choice of a printing method for cards of this class the character of the subjects and the quality of the original prints will generally decide. For street scenes and subjects with delicate detail gaslight post-cards are most effective; for broader effects sepia and platinum are suited.

Decorated Cards

One of the simplest ways of making a decorative post-card is to mount a print of the subject selected on a piece of white, gray or black card, placing a decorative design in black, white or gray ink around the print. This is then photographed down to the size required to exactly occupy the post-card. For this work a slow plate is preferable, such as a process plate, which will give a desirable amount of crispness and contrast to the copy.

In preparing an original for this use, some difficulty may be encountered in finding the relative proportion of the mounted original to the size required to exactly cover the post-card. A simple method of finding this proportion is given by W. A. Tanner, and may be useful to those unfamiliar with copying. I quote:

The method I adopt is that shown in the diagram. On a sheet of white paper or cardboard rule two lines at right-angles to each other, and, in the angle formed by the intersection of the two lines, mark out a rectangle the size of the post-card or other card to be produced. Through this rectangle draw a diagonal line, extending it to any distance. Now, any two lines drawn at a right-angle to the first two lines, and intersecting with the diagonal line, will form a rectangle that will coincide exactly with the smaller rectangle when reduced in the camera, whatever size the larger one may be. (Fig. 8.)

If it is a square card we wish to produce, it will be only necessary to mark out another square so much larger each way. But a post-card being oblong in shape, this method will not do, as when it is focused on the ground-glass in the camera it will be found that there will be too much subject-matter in the length of the card for the width, which will necessitate trimming the card. But if obtained by the method shown, any

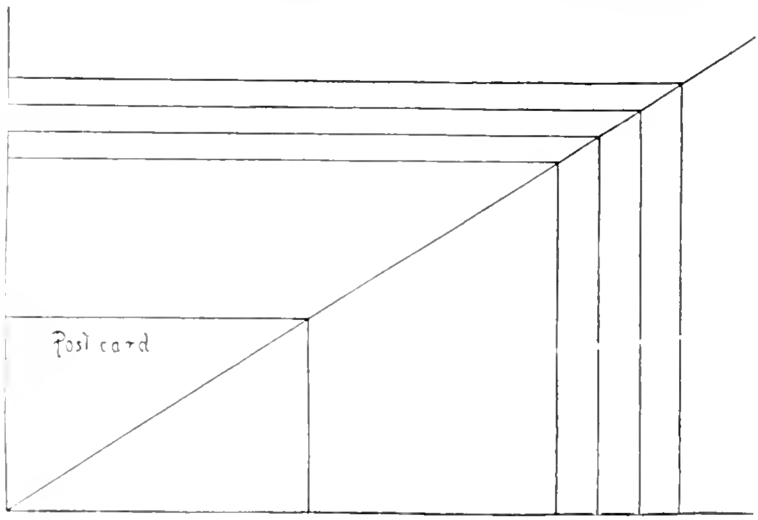

Fig. 8

larger rectangle will be in exact proportion to the original card.

To decide on the size required it will be better to mark out three or four rectangles of various sizes, as shown in the diagram, lay the print selected in the position it has to occupy, roughly draw in the design and greetings, filling up either one of the larger rectangles. It will be found that one having its longest side about double the length of a post-card, will be suitable for a half-plate print.

As all the work so far has been done with the pencil, the design may now be finished by inking-in and all the pencil-marks rubbed out. Or, if preferred, the rectangle may be drawn lightly in the center of another piece of cardboard, the print mounted in its position, and the design carefully copied and inked in.

A Cape Malay Laundry
Mrs. Caleb Keene

Afternoon
John M. Whithead

The print need not be pasted all over, only attached by a touch of paste at the top. It can then be copied under a sheet of glass, which will keep it flat and allow the print to be used in any way required afterwards.

Do not cut the card too near the size, but have a good margin all round, so that when copying on half-plate the subject may be kept well within the required space, and the extra width of the card, being black on the negative, will act as a safe edge when printing.

When focusing in the camera it is as well to cut a piece of black or brown paper to fit in the focusing-frame, against the ground-glass, and in the center cut an opening corresponding to the size of card to be used. This, when placed in position, will act as a mask. Care should be taken in focusing to see that the copy is exactly parallel with the ground-glass, both vertically and horizontally.

Coloring Post-cards

The charm of color is irresistible and the reader who will devote a little time and care to the tinting or coloring of his picture post-cards will enhance the value of his work and add to the pleasure it will give. In taking up this work it should not be forgotten that some subjects are more pleasingly rendered in the delicate gradations of monochrome, i. e., black and white or sepia, than in color; so that one should first of all ask the question: Will coloring really improve the rendering of the subject in hand? Of course, there will rarely be any question in the case of landscapes, seascapes, river views, floral subjects and so on; but portraits, street views, interiors and the like should not, as a rule, be attempted. Then again, for post-card work, the suggestion of color is generally more pleasing than an attempt at thorough or heavy coloring. Certainly, no effort should be made to approach the commercially "hand-colored" card.

A brief résumé of the method usually followed may be useful. I quote from Mr. Henry C. Delery, who has devoted much time to this work.

The matt-surface cards, such as Aristo Gold, Velox, etc., require a coating of Acme Solution and for collodion and glossy papers, Acme Medium, a different solution from the above, should be employed.

The surface of the card being ready, we proceed to apply the colors. As to the proper colors to use, this must to a great extent be left to the taste of the colorist, who should study nature in all her different moods and strive to imitate her. And here must it be mentioned that it is far better to color the view from the spot from which it was photographed and note all the varying lights and shades, a most enticing study, when we perceive color effects which would otherwise be impossible.

Beginning The first colors to be applied are the broad washes, such as the sky and foreground, in a landscape. In this instance it is preferable not to put the colors on too thick, as it is better to apply a second coat if the first is not dark enough; in fact the placing one color next to another has peculiar effects, and a shade which at first appeared too dark will change its tone considerably when other tints are added.

I find it advisable to use the brightest colors permissible with good taste, as the body of the photograph, being naturally dark, requires a greater brightness to give snap and vigor than the ordinary water-color drawing with its plain white paper for its background.

Sky For the sky, if pure white in the print and a plain effect is desired, Cobalt Blue answers best. A large brush is filled with the solution and beginning at the top of the print, the color is run across it with horizontal strokes, gradually diminishing the intensity as the horizon is reached where it should be almost white; here a slight tint of pink and yellow is added while the surface is still wet and the colors gradually and softly blended one into the other with pleasing effect.

Foreground The foreground next receives attention in like manner, and when completed, details can be worked out. One great rule should guide us in this operation, the foreground must be strong and bold and the distance subdued, gradually blending to a grayish purple to gain atmosphere and depth. Nature presents a kaleidoscopic panorama with ever-changing gradations of color effects and it would be impossible to set rules as to what color to

employ to gain certain results. This the student had better learn with a little experience. Generalizing, the following colors produce agreeable effects: Hookers Green No. 2 and Sap Green for foliage of trees and meadows, darkened with Prussian Blue or lightened with Gamboge as the occasion may require; for sunlight effects on those portions which receive the direct rays of the sun, Naples Yellow answers best. Trunks of trees may be gone over with Van Dyke Brown, brightened or darkened with Sienna or Green.

Colors As to the number of colors, very few are required, for with five or six primary colors, combinations can be made to obtain any desired tints. The following will suffice for an initial outfit: Cobalt Blue, Prussian Blue, Naples Yellow, Gamboge, Natural tint, Vermilion, VanDyke Brown, Burnt Sienna, Rose Madder, and Chinese White. Moist colors of some standard make, such as Winsor and Newton, are recommended as being convenient, especially when traveling. A small tinned japanned box as usually supplied, with a double cover, one having depressed panels to hold water for preparing the washes is very desirable. These are readily obtained from the art stores. As to brushes, only two or three are necessary, one should be quite large for broad washes, etc., another of medium size for general use; and a small, fine, pointed one for touching up small work and details. It is a mistake to use too small a brush, as the best results are obtained with a rather good-sized brush, say a No. 5.

When all is in readiness, a little of the color is taken from the pans and placed in the depressed panels of the color box; water is added until the desired consistency is obtained and the color applied in the manner described above.

REFERENCE

The only other work on post-card making is The Photographic Picture Post-card. By E. J. Wall and H. Snowden Ward. 1906. 104 pp. 50 cents.

Notes and Comment

Again we record, with jubilation, which cannot be kept back, the prospect of publishing THE PHOTO-MINIATURE regularly and on time before many months have passed. At this moment we have four monographs in sight, so that at least four issues of the magazine will follow this number as quickly as they can be put through press and published. There are plenty of subjects about which the world is athirst for information; but few workers who can and will write about them in an interesting and helpful way. So the difficulty has been, and is, to make or buy a monograph about photography worth publishing, once every thirty days the year round. Had we dreamt of the labors of the adventure, assuredly THE PHOTO-MINIATURE would not have been attempted. But it was begun—and the end is not yet. How loyally we have been encouraged and supported by those for whom the magazine is made! How patiently and impatiently the world has insisted on "the next number!" It has been a long and hard fight, but the reward in good will and appreciation has been worth the fight.

Mr. and Mrs. H. Snowden Ward, of London, are at present on a visit to this country. Mr. Ward is engaged in a lecture tour embracing the principal cities of the East and Canada, while Mrs. Ward is spending a few weeks with her family and friends. Those of our readers who have a European trip in view for this summer will be interested to know that Mr. Ward is this year's President-Elect of the British Photographic Convention, which is to take place in July, with the beautiful and historic city of Canterbury for location. Americans who can arrange to attend the Convention are cordially invited and assured of a thoroughly enjoyable time.

A decided impetus has been given to telephotography in this country by the introduction of the Pancratic Telephoto Lens (Gundlach-Manhattan Optical Company, Rochester, N. Y.). This is an exceedingly compact instrument which can be instantly fitted to any 4 x 5 or 5 x 7 shutter made by the Bausch and Lomb Optical Company, or Wollensak Optical Company, and sells at the remarkably low price of $15 in cells. The magnifications offered with the Pancratic range from three to eight times, requiring camera extensions of from eight to twenty-three inches. A more complete account of the lens will be given in an early issue, but those interested should send for the circular.

Mr. L. J. R. Holst, for some years past the active head of the C. P. Goerz American Optical Works, New York, advises us that he has severed his connection with that company. Few men within our acquaintance have so lovable a personality or so practical a knowledge of the tools and technique of photography as friend Holst. We trust, therefore, that the change is but the entry into a new field of photographic usefulness, which will keep him with us for many a year to come.

A clever little booklet about photographic printing-papers has just been issued for free distribution by the Defender Photo Supply Company, Rochester, N. Y. It is titled "The Tipster" and, true to its title, is full of helpful tips, formulæ and useful information.

A fairly extended course of practical development, including plates, films and development papers, has thoroughly convinced us that the new Time Developer invented by Alfred Watkins, and described by him in the American Annual for 1909, is a big convenience and a very real help towards success in negative making. Since its introduction a few months ago this Developer has won great popularity in Britain. It can now be obtained, in powder and liquid form with full instruc-

tions for use, from the American agents, Burke & James, Chicago.

The 1909 U. S. edition of that indispensable pocket book, "Wellcome's Photographic Exposure Record and Diary," is now ready for delivery. It has been further improved in several features, which, with the rest of the world, we did not think possible. The price is fifty cents, postage free.

We learn from the Ansco Company, Binghamton, N. Y., that the capacity of its immense plant is being severely taxed to keep up with the increasing popularity of Cyko paper, especially since the introduction of Professional Cyko. The new edition of the Cyko Manual, which can be had on request, describes this and all the other Cyko brands. It is a valuable handbook for users of development-papers and should not be overlooked.

The Western Photo Supply Company, 82 Third street, San Francisco, Cal., has been appointed agents for the sale of Crown lenses in California, Arizona and Nevada, and will carry a full line of these lenses in stock from this time forward. They will also carry a complete line of Crown anastigmat lenses mounted in Koilos shutters.

Books and Prints

All books noticed in these pages may be obtained from the publishers of THE PHOTO-MINIATURE, and will be promptly forwarded, postpaid, to any address on receipt of the publishers' prices as here quoted.

The British Journal Photographic Almanac, 1909. Edited by George E. Brown, F. I. C. 1336 pages; illustrated. American sales agents, George Murphy, Inc., New York. Paper covers, 50 cents; postage, 27 cents; cloth bound, $1; postage, 37 cents.

Think of a handy volume in which one man, by weeks of diligent and intelligent editing, has compressed every item of photographic progress chronicled in 1908; classified in sections and paragraphed for easy reading; illustrated and fully indexed for ready reference,—and you have one view of the "B. J. Almanac," 1909.

Think of an up-to-date encyclopedia of photographic formulas, processes, methods, novelties, inventions, materials and apparatus, covering every practical application of photography, made up from the catalogues and lists of over two hundred photographic manufacturers and covering more than 850 pages,—and you have another view of the "B. J. Almanac," 1909.

It would be difficult to specify anything of interest in the photographic theory and practice of today which does not find place in this truly remarkable compendium of information, and yet, with the aid of the four indexes at the end of the book, each and every item may be located at a glance. In these indexes and in the complete rearrangement of the contents of the "Almanac" we have a decided improvement over the "Almanac" of a few years ago, for which the present Editor deserves the reader's appreciative thanks. In addition to the encyclopedic array of formulæ, facts and figures, the volume offers a monograph on "Reflex cameras" which,

of itself, is well worth the price of the book and forms a capital supplement to THE PHOTO-MINIATURE No. 77: Focal Plane Photography. There is also an interesting paper on "Canada as a Field for the Photographer," which will answer the questions of many professionals about the practical possibilities of that land of promise.

The "Almanac" can be purchased from any dealer for 50 cents, or in substantial cloth binding for $1. Bought in this way the heavy but necessary postage tax may be avoided, but the book is a bargain at five times its price.

We note with pleasure the increasing use of the camera in the preparation of individual or private Christmas and New Year cards, calendars and the like. Among the many welcome greetings of this sort for which we have to thank readers in all parts of the world, we cannot forbear mention of those sent by H. Snowden and Catharine Weed Ward, J. Horace McFarland, Julius Strauss, Pirie MacDonald and W. I. Scandlin.

In the December *Prism*, a dainty magazinelet of lens information issued gratis by the Bausch and Lomb Optical Co., Rochester, N. Y., Mr. C. H. Claudy brings up the timely subject of "Snow Pictures" in a poetical, pictorial, personal and practical way which makes one want to get out into the woods, fields and city streets knee-deep in snow, with the inevitable Kodak and the equally inevitable Tessar. A combination big with possibilities, as Mr. Claudy puts it: "B-R-R-R-R-R-R-R! . . . . never mind the B-R-R-R-R-R-R-R-R-R!"

Dr. Nathan T. Beers, with whose clever work in high-speed photography our readers are familiar, sends to our table a marked copy of the *New York Medical Journal* containing an interesting summary of his experiences as a dermatologist with "Dermatitis from Metol." In our own practice we have not experienced the slight-

est inconvenience from the use of metol, although we have employed it freely and continuously, without care or precaution, since its introduction many years ago. Nevertheless the following suggestion from Dr. Beers may be useful to some one. "I have found a saturated solution of paraffin in benzoin about as satisfactory as anything in the way of a protective application. The fingers are dipped in this solution before developing and the benzoin allowed to evaporate, leaving the skin intimately covered with a thin coating of paraffin."

Photograms of the year 1908. Typical photographic pictures of the year reproduced and criticised. Compiled by the editors and staff of "The Photographic Monthly." 168 pages, about 200 illustrations. London: Dawbarn and Ward, Ltd. American agents, Tennant and Ward, New York. Paper covers $1.00. Cloth-bound $1.50, post free.

The familiar adage concerning "good wine" applies most aptly to this delightful annual, which every year shows improvement in interest and usefulness to the picture-maker in photography. Those who want a detailed critique of tht recent London Salon and the exhibition of the Royal Photographic Society, with some account of the progress of pictorial photography in Continental Europe, Australia, Canada, South Africa, etc., and reproductions of some two hundred selected pictures, will find these things in *Photograms of the Year 1908* and nowhere else. The volume is an inspiration. We wish that we could send it broadcast to the photographers of the world.

The Telephoto Quarterly. An illustrated record of progress in telephotography. Edited and published by Capt. Owen Wheeler, Weybridge, England. American Agents: Tennant and Ward, New York. Subscription in U. S. A., Canada and Mexico, 75 cents per year (4 numbers). No. 1 published March 25, 1908. Nos. 2, 3 and 4 now ready.

This is a belated note of welcome for an extremely

interesting little journal which came under the writer's eye during the past summer. It is edited and published exclusively for those who are interested in the telephotographic lens and its practical use. With the growing popularity of telephotography and its notable development in recent years, the need of such a magazine has become more and more evident, and it would be difficult to name any one better equipped than Captain Wheeler for its making. Like THE PHOTO-MINIATURE in size, appearance and character, "T. Q." is a magazine of practical information, dealing with facts and working methods from actual experience rather than with windy theories. This much may be gathered from the following titles of articles in the issues so far published: Exposure in Telephotography; Telephotographic Definition (illustrated with examples up to 38 magnifications); Telephotography for Naturalists; Instantaneous Telephotography; Novelties in Telephotographic Apparatus; Telephotography with Small Cameras, and so on. Some of the illustrations show the best telephoto work we have yet seen; all of them have technical quality in an unusual degree. We commend "T. Q.," unreservedly, to all photographers who have telephoto outfits, and especially to those who have the purchase of such an outfit in mind.

Altogether the best thing of the kind we have seen. Such was our comment after a hasty reading of the "Descriptive List of Dry Plates, Filters and Safelight Screens" recently received from Wratten & Wainwright, Ltd., Croyden, England. A second reading of this "List" confirms the earlier opinion. The amount and character of the practical information its pages offer about dry plates, ordinary and color sensitive, screens and lightfilters, dark-rooms, safelights and similar manipulative details would safely warrant its republication in THE PHOTO-MINIATURE series, but for the plain fact that it was prepared as a trade list of the manufactures of its publishers. As Messrs. Wratten & Wainwright's products are not obtainable on this side, the "List" can necessarily have only a suggestive interest for

American photographers, but those who by courteous request can persuade the publishers to send them a copy will undoubtedly give the writer their thanks for the suggestion that they make the attempt. It might be as well to enclose 5 two-cent stamps to cover the cost of the "List" and postage, with mention of THE PHOTO-MINIATURE.

The American Annual of Photography, 1909. Edited by John A. Tennant. 350 pp., over 200 illustrations. Paper covers, 75 cents; postage, 15 cents. Cloth bound, $1.25; postage, 22 cents.

As most readers of THE PHOTO-MINIATURE know, this is the only distinctively American photographic yearbook. Since the first volume was sent out in 1896, under the able editorship of C. W. Canfield, the book has been made up of three sections, devoted respectively, to practical papers on subjects of photographic interest, contributed by well-known workers here and abroad; selected examples of pictorial work sent in by American and foreign photographers, and a photographic formulary, giving typical or standard formulas covering every-day work in photography. This traditional arrangement has been followed in the 1909 volume with, according to generally expressed opinion, greater success than in any preceding issue. The improvement is seen in the more practical character of the contributed papers; in the broader scope and variety of the illustrations and a higher standard of quality in reproduction and printing, and in a thorough revision of the formulary.

Among the many prominent workers in photography, who have contributed to the pages of the 1909 "Annual," we may mention A. Radclyffe Dugmore, William Findlay, C. E. Kenneth, Mrs. Henry C. Delery, Mrs. Helena C. Sutherland, James Thomson, Charles M. Carter, H. S. Hood, Howden Wilkie, Alexander Mackie, J. A. Anderson, Malcolm Dean Miller, Dr. H. D'Arcy Power, Dr. Vaughan Cornish, William Farren, J. W. Little, W. J. Farthing, C. H. Claudy, Thomas Bedding, Alfred H. Saunders, Charles

E. Fairman, Alfred Watkins, H. Snowden Ward, Edgar A. Cohen, John H. Gear, Wilson A. Bentley, Frank E. Huson and R. T. Jeffcott.

The pictures are fairly representative of the best current work in pictorial photography, without extremes, and include prints from R. Dührkoop, Charles H. Davis, R. Eickemeyr, E. O. Hoppé, William Crooke, A. R. Dugmore, Theo. Eitel, Arthur Elliott, Robert Burnie, Helen W. Cook, Catharine Weed Ward, Mrs. Caleb Keene, A. Keith Dannatt, John Beeby, W. E. Dassonville, Mrs. J. E. Bennett, C. F. Clarke, Curtis Bell, William Gill, Henry Hall, Mrs. W. W. Pearce, and many others of equal note.

To those who are familiar with the significance of these names, their mere mention is sufficient to show the real value and interest of *The American Annual, 1909*. It is a treasury of information and inspiration which no earnest photographer can afford to miss.

Plate I. Mme. de Vancay.—Ingres

The Photo-Miniature
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EDITED BY JOHN A. TENNANT

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Essentials in Portraiture

There are few persons of whom a pleasing portrait cannot be made, and it is within the power of almost anyone who can handle a camera to make a pleasing portrait, if he or she knows how to go about it.

Technical proficiency in photography today offers no great difficulties. It is all simplified, and can be acquired by applying one's adaptability, with patience and perseverance. Similarly, the choice of subjects should prove a comparatively easy task to the camera-worker, since he deals with actualities. The subjects come to him and he has merely to translate them by means of a mechanical process, and not, like the painter, by the less reliable, though more flexible, eye and hand. All that the photographer needs to permanently "fix" a pleasing subject is good taste, or rather judgment, at the right moment. There's the rub! What do we mean by good taste and judgment in portraiture? Largely, it may be taken for granted in an unconscious or conscious knowledge of the laws of composition. As long as the mind acts unconsciously of this knowledge, it is merely a matter of feeling or good taste; as soon as we become conscious of this knowledge, we exercise judgment or selection in what we do.

Taste: Judgment

Good taste, or the unconscious feeling of what is correct or best, is often implanted by nature, just as some people are born with the gift of poetry or song. Even as a natural gift, however, good taste can be cultivated and improved by the study of a large variety of pictorial work; by analyzing the pictures one sees, and trying to discover the reason why and how such work impresses us as being beautiful.

The conscious knowledge of judgment or selection, on the other hand, is not to be acquired without first an acquaintance with the fundamental laws of composition or the faculty of seeing correctly. We must begin at the beginning, and realize that the rules of composition in picture-making are based on a few fundamental laws, which A B C of art must be understood before the student can aspire to the real mastery of the subject.

Good taste and judgment, therefore, not being necessarily natural gifts, can be acquired and cultivated as are other faculties; genius in this, as in other lines, is only another name for hard work and application. This should not affright or deter the reader. It is simply a matter of self-education, of keeping one's eyes open, learning when and wherever we can, of continually enriching one's store of form-knowledge, and of reasoning out for one's self why this art expression is pleasing and that displeasing in what we see.

The Field

In this monograph we deal exclusively with portraiture, the most delightful, as it is the most subtle, of all branches of photography; the most interesting, since it is concerned with the human interest in life. I hope to show clearly and in a simple, common-sense way the few essentials in this branch of work which those who attempt portraiture should know, and which, if followed, will give successful and pleasing portraits.

Tone

The majority of pictorialists seem to consider the realization of tonality to be the beginning and end of photographic art. They see nothing beyond it, and even are willing to sacrifice line, contrast, and light and shade effects, to secure the mellow richness of one uniform tint.

Its Importance

In a way, this one-sided viewpoint is justified, as there is nothing which gives a photographic print so much elegance, distinction and technical "finish" as a complete tonality. How is tone accomplished? In a portrait there is only one point of interest,—the face. Everything else, as a matter of course, should be subordinated to it. Consequently the problem of producing tone in a portrait consists largely of eliminating everything that is unnecessary. To select a middle tint for the facial plane, and to lose the rest of the body and the background in a darker tint, as uniform as possible. All parts that are lighter than the facial plane, as may happen in collar, shirtfront, flowers in a woman's hair, etc., must be exceedingly small in comparison to the space occupied by the darker tints; they must merely serve as accents or emphasis.

Plate II

In Plate II we have five specimens of tonality (Figs. 2–6), and one (Fig. 7) in which all feeling for tone is lacking. This latter is a pleasing, well-composed picture, but too confused and broken up to produce the impression of tone. The same applies to the outdoor portrait (Fig. 11, Plate III). The portraits of Dr. H. O. Macy and Countess Cassini, by H. H. Pierce (Figs. 2 and 3, Plate II), on the other hand, carry out fully my explanation in the last paragraph. Fig. 2 is not far from being a masterpiece. Notice how the tonal gradations of the face are repeated in the fur cap and cape, and how the white spots of the shirt help the facial complexion and throw back the rest of the picture.

Tone has nothing whatever to do with proportion, line or space arrangement, and very little with texture and contrast.

The Relation of Tints

Manage the proper relation between four or five tints, combine them in a way that they produce a harmonious effect (and this is largely a matter of good taste), and you are sure to get tone. Fig. 3 (Plate II) is not quite so good as Fig. 2. The tonal gradations are not sufficiently differentiated. The background and silhouette of the hat and body are blurred. The picture lacks strength.

2 3

4 5

6 7

PLATE II. Figs. 2, 3, 4, 5, 6, 7. Read across the plate from left to right. Nos. 2 and 3 copyright, 1905, by H. H. Pierce; No. 7, copyright, 1903, by A. S. Campbell Art Co.

Fig. 4, a charming Mother and Child picture by our great figure painter, Abbott H. Thayer, is excellent in tone, as all good paintings necessarily are, but it is not a good specimen for photographers to follow. Reproductions never are. The painter produces tone by color, the photographer by monochrome tints. As color is hardly ever photographed accurately, and as even painters do not seem to be able to judge the black and white reproductions of their paintings, it is futile for the photographer to try and learn from them. Guesswork never pays. One may study line, contrast, character and handling of accessories from reproductions, but not tone.

Blurred Effects

The study head "Erna" (Fig. 5, Plate II) by one of the younger Secessionists, Miss Bessie Buehrman, is a trifle muddy in the flesh tints, and the background is too monotonous. These, however, are minor shortcomings; on the whole, it is a pleasing tone picture. In Fig. 6 (Plate II) we have a specimen of the blurred effect. The tonality is accomplished rather by indecision of outline than by a clever juxtaposition of tints. Fig. 9 (Plate III) shows to what extremes some of the pictorialists will go. They mistake darkness, monotony and opaqueness for tone. The picture has many excellent qualities, but, as far as tone is concerned, it simply serves as an object-lesson—and a rather strenuous one—as to what should be avoided. Indistinctness at times may be pictorial, if skilfully and sparingly used, but it has no place in portraiture.

There seems to be rampant an erroneous idea that tone is synonymous with darkness. Common sense should tell us that a uniform tint is just as easily accessible in the lighter as in the darker tonal gradations. And yet it took the craftsmen of the camera years to find it out. Alvin Langdon Coburn was hailed as the innovator. He has heightened the key of tone composition, and it is largely due to him that—to talk with an English critic—"the gloomy glimmering and Aubrey Beardsley-like straining after effect of American pictorial photography" has changed into something brighter, more beautiful, and less painful to contemplate. Coburn's management of silhouette and middle tints, never

approaching pure white or the deeper grays and blacks (as shown in the portrait of the author of these lines) is masterly. (Fig. 12, Plate IV.)

Scale of Tonal Gradations

If we draw a diagram as shown in Diagram 1, in which *a* represents the deepest black and *e* pure white, and the line between these two points the various tonal gradation from black to white, we shall notice that some photographers, as Eickemeyer, for instance, in

Diagram 1

Fig. 7 (Plate II) use the whole gamut; that the Secessionists work with preference in the region *a–b* with an occasional spurt to *d–e*, for the sake of accent; while Coburn, in the majority of portraits which made him known is satisfied with the few tonal gradations that lie between the points *c–d*.

Tonality in a lighter key is really nothing new. We have it, for instance in "The Little Princess" by Craig Annan. (Fig. 10, Plate III.) He realized tone without becoming somber, weird or eccentric, and the effect is certainly as pleasing, if not more so, full as it is of interesting details throughout.

Tintoretto's Example

Of course, I perfectly agree with the argument of the tonalists, that the juxtaposition of eight to nine tints is never so fine as when only three or four are used. But why must distinctness be sacrificed? Can anything simpler and more perfect be imagined than the "Portrait of a Man," by Tintoretto! (Fig. 8, Plate III.) There are only four tints: the background, which is repeated in the hands and the darker parts of the face; the complexion of the face, which we find again a trifle lighter in the cuff; and two deeper shades for the dress and beard.

Variation in Tint

You may argue that the background is not entirely uniform, that it contains slight variations. Of course it does. Every tint must contain slight and subtle variations or it becomes absolutely monotone. And that is just where the extreme pictorialists are wrong. They produce flat

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PLATE III. Figs. 8, 9, 10, 11. Read left to right

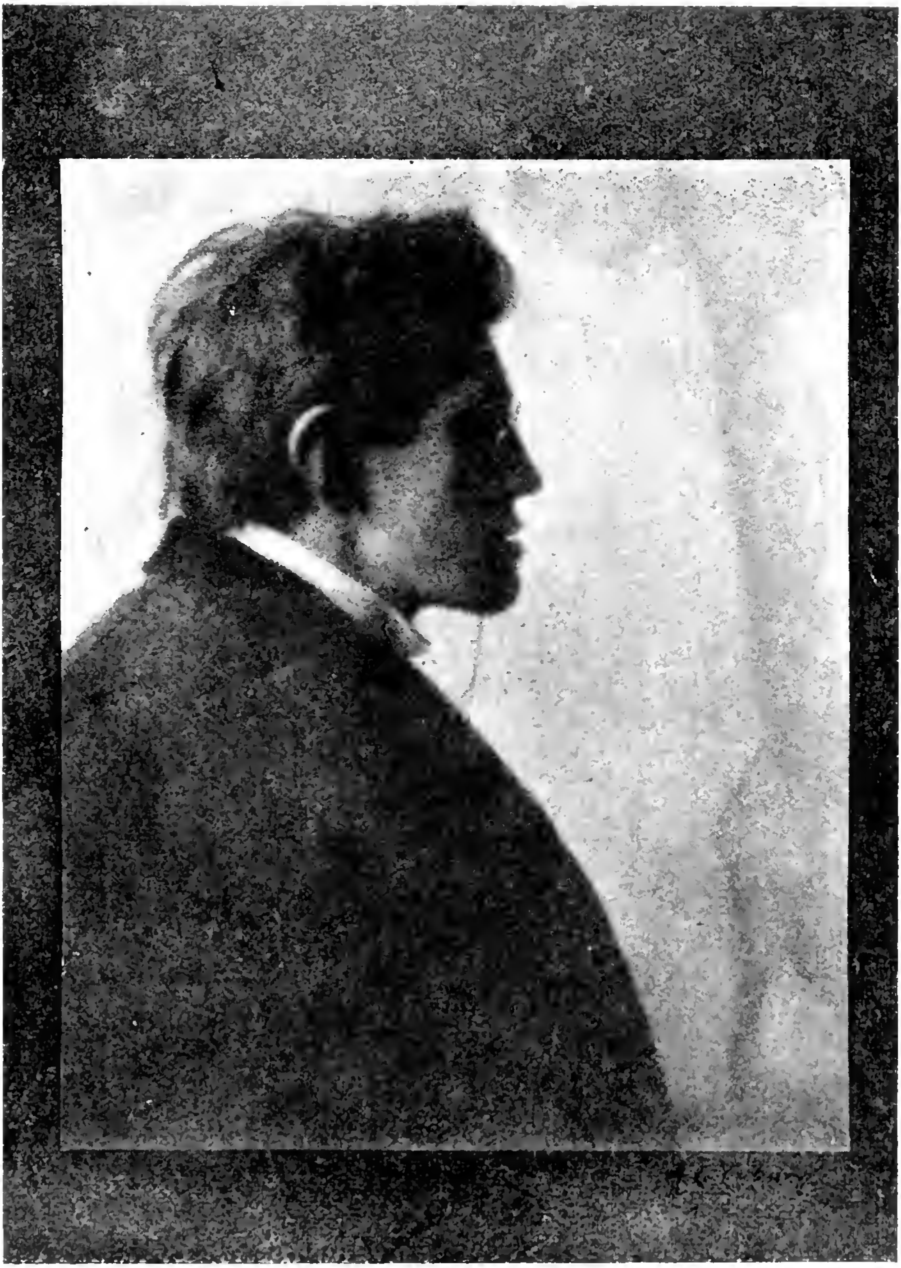


PLATE IV. Fig. 12. Portrait of Sadakichi Hartmann.—Coburn

tints instead of tints vibrant, as it were, with some inner life. Do you not think that most of the pictures in Plate II and III could be improved, even Pierce's Dr. Macy, if the background were less opaque? Planes carried out in a single tint give the impression of a dull, dead surface; they should contain those slight variations that are hardly distinguishable and yet belong to the same tint. Only then does a picture have the vibrant quality which is the great charm of all pictorial work.

Tintoretto kept everything in large, well-defined masses, beautiful in their straightforward simplicity. No accidents have entered into that picture. The details are entirely subordinated to the finer elements of tone.

Line

There is an anecdote about Turner to the effect that, once having taken a memorandum in water-color, he said to a friend near him: "How much more I should have got with the pencil point!" He realized that a line will often tell more about a form than can be expressed with much more labor by coloring a space.

The line, on account of its extreme and even unrivaled obedience to the slightest variations in the sentiment of the artist, is precious in the highest degree as a means of artistic expression. It speaks a language all of its own, which enables the artist to convey a good deal to the intelligent observer acquainted with that language.

Lack of Line Feeling

In pictorial photography, a general indifference towards line-feeling has become palpable of late. The present tendency to strive for hazy and blurred effects permits no frank display of lines. There is a desire to hide line under graduated tones and to obliterate it altogether. In a word, many of our extreme pictorialists attempt to *paint* rather than *draw* their compositions.

For my part, though fully recognizing the rich tonal quality they aim at, I believe that the feeling for line ought to be preserved and made the most of.

Systems of Composition

Many teachers of composition have tried to fathom and explain the laws that underlie line expression. As far as I can see, there are only two systems of composition:

(1) The principles of geometrical construction as developed by the old masters.

(2) The unsymmetrical devices as introduced by modern impressionism (a system that evolved from the canons of Japanese composition and the haphazard fragmentary representations of the camera).

It will only be necessary to study some really genuine works of art, like Leonardo da Vinci's "Last Supper," Raphael's "Sistine Madonna," or Titian's "Entombment of Christ," to comprehend what an important part geometrical construction played in the pictorial inventions of the old masters. The whole success or failure of their work, the sentiment, the character, the triumph of soul over matter, hinged on composition in these times. How marvelously do all the lines in Da Vinci's picture converge to the central figure of Christ! He made the laws of perspective the laws of this composition. More frequently, however, he, as well as most of the old masters, applied, with preference, the triangle, the circle and the ellipse, giving them full sway to reign in supreme beauty over the creation of their brain. The situation has somewhat changed in modern times. Landscape painting has become more in vogue, and with it pictures of oblong shape; geometrical construction has been more or less abandoned, only the ellipse is still in great favor among landscape painters.

The Modern Idea

Composition is, by some, no longer considered absolutely essential. It is even disregarded, alike by realists and impressionists, or at least subordinated to other qualities. They want to represent life as it is or as it appeals to them, and claim that nature cannot be improved upon. A faithful reproduction of what they see is all they desire. They claim their work in broader principles, and even assert that composition is no necessity, that there are no iron laws to go by, and that the artist works out his own salvation unconsciously.

On this point I beg to differ. There is no such a thing as a good picture without composition. Even the paintings of the extreme impressionists show a perfect balance of parts. Only the principles of composition have changed in application.

The Japanese Ideal

The modern artist looks at life from a different point of view. Photography, particularly the instantaneous photography of movement, has trained his eye to note transient effects more clearly than hitherto. His aim is no longer to give a perfect pictorial illusion of an object, but rather to *suggest* it. While the artists of the sixties and seventies were working out this new problem, Japanese art suddenly became widely known; and, strange to say, it was just what the Western artists were looking for—an art which rather suggests than actually depicts a subject or an idea. There was a branch of art that was almost antipodal to that of the old masters. Its various elements, notably its parallelism of lines, its continual repetition of forms with slight variation, its wayward caprice of emphasizing detail here and scorning it there, its system of curved lines, and its harmony of space proportion, were all qualities which had the charm of novelty; and they were cheerfully adopted by the Western art-workers.

A Matter of Feeling

The laws that underly these various modes of expression are entirely too subtle and contradictory, and dependent on individual interpretation to be analyzed. My opinion is that they can not be taught. They are entirely a matter of feeling.

Of course, in the composition of elaborate groups, such as the Old Masters painted and some of our modern painters make, the science of line becomes a more important factor; but in ordinary portraiture, which is limited to bust portraits or single figures, it does not play quite such a conspicuous part.

The Triangular Shape

The average portrait represents geometrically nothing but a triangular shape with an oval as apex (Diagram 3). In a standing portrait it is a more or less oblong shape topped by the same head of pyramidal shape (Diagram 4) as in a bust portrait. Besides, there are only two other controlling shapes possible in portraiture: either an irregular form, as in Diagram 5 and Fig. 25 (Plate VI), or an undulating line which divides the pictorial plane diagonally into two planes of almost equal size. There

is really no other shape possible. They may be modified and exaggerated, but fundamentally every shape will resemble somewhat the shapes of Diagrams 3–6.

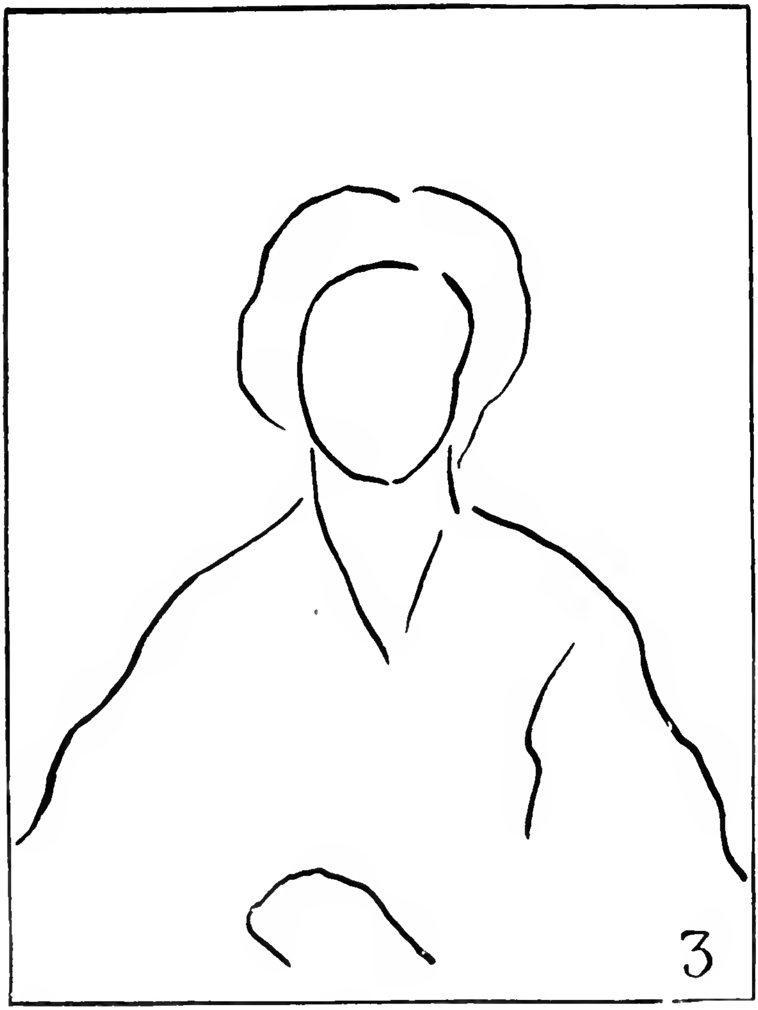
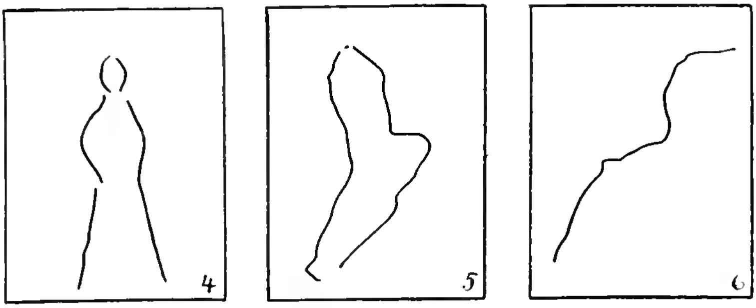


Diagram 3

Combination of Lines

All the other lines must conform to the boundary lines of the silhouette, and all movement possible to them is that they either run more or less parallel with these boundary lines or intersect them at various angles. If a figure

shows a decided vertical tendency in its lines, there should be no horizontal lines excepting, perhaps, the one which would denote the dividing line between floor and wall (Diagram 7*a* and Fig. 21, Plate VI). And



Diagrams 4, 5 and 6

even then it would be better if it were slanting, as indicated by the dotted line in Diagram 7*a*. A vertical composition could be crossed by diagonal lines or by a simple oblong shape, as a frame as shown in Diagram 7*b*; but the horizontal lines should not cut into the figure. A diagonal composition is generally greatly improved by some vertical line in the background, as in Diagram 7*c* and Fig. 22 (Plate VI). A decided diagonal line, on the other hand, as in Diagram 7*d*, would hardly stand either vertical nor horizontal interference,

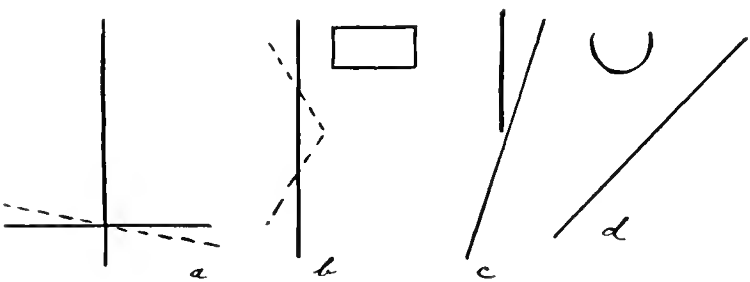


Diagram 7

but would only harmonize with some round shape (Fig. 19, Plate V).

To establish indisputable laws as to how lines combine and operate upon each other is absolutely futile, and even if it could be done no artist would follow it

out. All that is possible in a work of this kind is to analyze the general character of line.

The Character of Lines

Experience will show that a straight line invariably lends strength and vigor to a position. Notice how heavy the composition in Fig. 24 (Plate VI) becomes by the black bands. A curved or round line assures a broad and opulent effect, viz: Plate I (Frontispiece) and also Fig. 23 (Plate VI), where the round lines are cleverly balanced by straight lines. The undulating line is the most graceful expression pictorial art is capable of. We all know Hogarth's line of beauty, shown in Diagram 2.

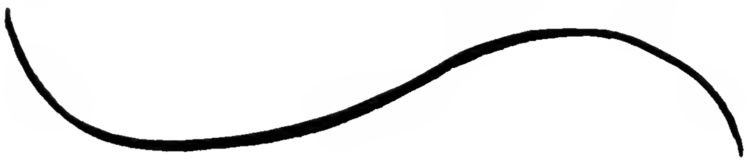


Diagram 2

It is visible everywhere, visible in all forms of nature and expressions of life. Get it into your pictures as often as you can, it will always add to the beauty of your compositions.

An Ingres Portrait

Let us investigate the line feeling in some of the illustrations. In a woman's portrait a straight line is hardly ever desirable. (See Plate I—Frontispiece.) It may be applied in the background. (Figs. 21 and 22, Plate VI.) The portrait of Mme. de Vancay, by Ingres, is one of the finest examples of the application of the round line. There is no straight line in it. Everything is sinuous, flowing, full of expression, and the way the lines meet and intersect each other is admirable. You can learn from one picture like this more than by a dozen chapters on the balance and relation of lines.

In Fig. 15 (Plate V) an ordinary child portrait, you have line, but no knowledge behind it. It is merely line as seen in ordinary life against a light background. There is no attempt to beautify it. In Fig. 22 (Plate VI) on the other hand, we notice a distinct attempt towards line production, particularly in the upper part of the body. It is not quite successful, but it teaches

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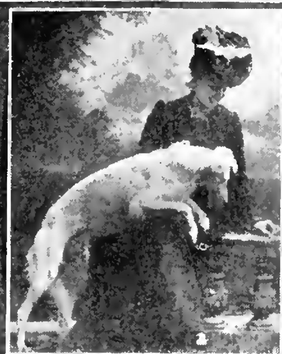

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PLATE V. FIGS. 13, 14, 15, 16, 17, 18, 19, 20.
Read left to right

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PLATE VI. Figs. 21, 22, 23, 24, 25. Read left to right

the lesson that a diagonal line in a narrow oblong—as most standing figures are—is more graceful and picturesque than the majority of curves that could be arranged on a straight standing body (viz. Fig. 21–Plate VI). The latter are apt to produce the feeling of simplicity.

Figs. 23 and 24 (Plate VI), by two German photographers, show good line feeling; but it is more an attempt at "drawing," to show the beauty of detail from a linear point of view rather than the flow of lines. The character of both compositions seem to be largely due to the structural or anatomical peculiarities of the model. The portrait of the painter Walton (Fig. 25, Plate VI) is interesting as a study in angles and straight lines. But, taken at its best, it is rather awkward and unsatisfactory. An abundance of angular lines is seldom beautiful.

A surprisingly bold study in curves is presented by by Aurig's "Lady and Dog" (Fig. 16, Plate V). The way in which the foliage repeats the line-curve of the dog's back is unusually clever. It shows that originality is by no means impossible, but a critic can hardly hold it up as an example for imitation.

Value of Parallelism

Parallelism of lines, if sparingly used, is always effective. Notice the arm of the mother and the leg of the child in Fig. 17 (Plate V), a picture of rare linear beauty; and the repetition of the blunt angle made by the arm and the lines of the shoulder and neck in Fig. 17; and of the hands and the top of the bodice in Fig. 22 (Plate VI).

Line Studies

These examples are sufficient to show that the modes of expressing one's feelfor line are very numerous. To those who desire to become more efficient in line composition, I would recommend the following studies:

For straight and absolute power of line, the works of Michael Angelo and Millet, of Manet and Homer.

For precision of line, the classic purity of Greek statuary, the paintings of the early Dutch painters, of Raphael, of Ingres, Lefebvre and the pre-Raphaelites.

For delicacy and subtlety of line, the works of Botticelli, Japanese prints and picture-books, and the etchings and lithographs of Whistler.

For rectangular line composition, study the architecture of Greek temples, the mural paintings of Chavannes, and the landscapes of Hiroshige.

For horizontal line composition, study the works of D. W. Tryon, an American landscape painter.

For triangular line and other geometrical composition, sculptural groups (containing two or three figures), the works of Murillo, Raphael and other old masters.

For curves, the Japanese painters of women, like Outomaro, Yeichi, etc.

For irregular line composition, the works of the Impressionist schools and their followers.

The more you study line, the more valuable you will find the photographic line as a means of pictorial expression. It will often explain, suggest and interpret objects far more clearly and vividly than any other technical means at our disposal.

Space Arrangement

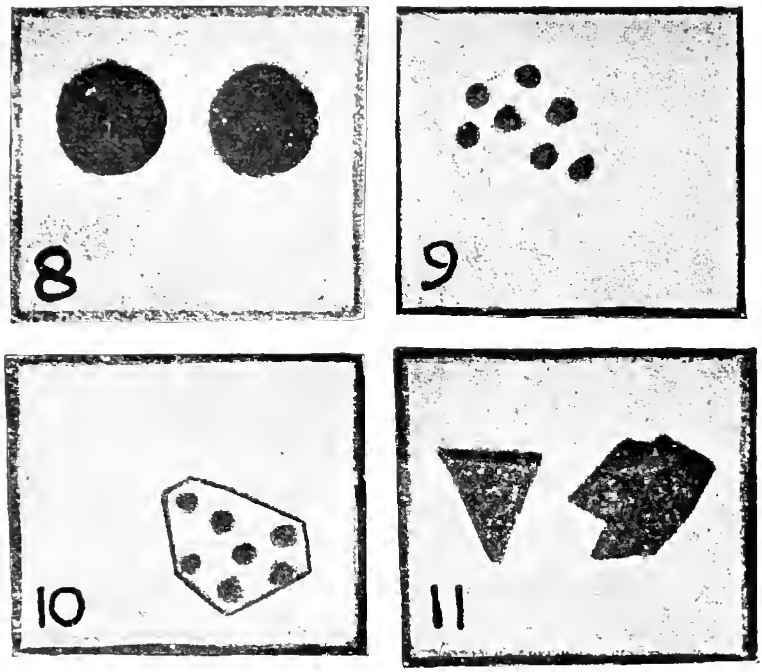
Closely allied to line feeling is space arrangement. Figs. 13, 14, 16, 19, 20 and 21 (Plates V and VI), are excellent examples. They show that space arrangement depends, largely, on a skilful division of the space at one's disposal into distinct geometrical, tinted shapes that perfectly balance each other. The simplest compositions of this kind are represented by black figures on white ground, or white figures on black ground. Arrangements of this kind impress one generally as being rather crude. It takes a master to work in such simple material successfully, as, for instance, Tintoretto in his "Portrait of a Man" (Plate III). But as soon as several clearly outlined, variously tinted shapes are introduced, a new realm of pictorial possibilities is opened up. Each shape has a certain relation of proportion and contrast to the other.

Space arrangement may be compared to a game of chess, in which light and dark planes fight for supremacy. There are a few optical laws which will readily be endorsed by everybody studying the subject.

Geometrical Shapes

Two spots of equal size in a picture are always disquieting, particularly so if they are symmetrically arranged (Dia-

gram 8). The eye restlessly wanders from one point to the other. A similar feeling of restlessness is produced by too many spots of equal size (Diagram 9). They grow into a harmony only if arranged in some geometrical shape (Diagram 10). Of two large planes one always must be subordinated to the other, and it is in



Diagrams 8, 9, 10 and 11

most cases the smaller one (Diagram 11). If they are almost alike in size, it is the one which is most compact and least irregular.

The silhouette of these shapes must be agreeable to the eye, as for instance the white space between the heads of two girls in Fig 13 (Plate V). Furthermore, if the whole background had been left white, the figures would look rather awkward; for that reason the photographer produced, by the means of a curtain, a dark oblong on the right side of the picture. I have tried to make this more clear by Diagrams 12 and 13*a*, but the point will be obvious as we familiarize ourselves with similar subjects.

Diagonal Division The most profitable form of space arrangement is when the figure is placed on one side of the picture, and its silhouettes form a slanting line across the picture, as shown

Diagram 12

in Diagram *7d* and Fig 19 (Plate V). A picture constructed on this principle will always be successful. It will compose itself. All it needs is some spot in the upper left-hand corner to balance the big plane pre-

sented by the figure. The composition of Kasebier's "Woman with Beads" (Fig. 20, Plate V) is based upon the same principle.

Another kind of space arrangement is shown in Fig.

Diagram 13*a*

14 (Plate V). There the oval of the face is balanced by the triangular shape of the open portfolio, which brings us back to Diagram 11. It is really all very simple when once we have grasped the principle involved.

W. M. Chase's Advice

Perhaps the easiest and most practical way to improve one's judgment, whether the subject or scenery before him contains the elements of a good picture or not, is to follow the advice which the painter, William M. Chase, gives to his pupils.

Make a small empty frame of blackened card-board or any convenient material; carry it with you whenever you are photographically inclined, and look through it at those things that interest you. You will begin to see everything in pictures, clean cut by the four boundary lines of the frame; and as soon as you move the frame from one side to another, all nature will seem to you to be divided into innumerable pictorial fragments. There is a good motif, you think; so it is, but shift the frame a little to the right or to the left or upward or downward. As the boundary lines change, the picture changes. Do you like it better now than before? If the fragment of nature which you see through the frame conveys something to you, well and good; if it doesn't, try again with another part of the scene.

Primitive but Reliable

This is, of course, a very primitive way of getting at the laws of composition, but it is a very reliable one, and it will not play you false as long as you have confidence enough in your judgment. Try to analyze the arrangement of each scene into parts, into lines, planes, and the gradations of one tone into the other. It will develop and perfect your own faculties, no matter whether you are a mere beginner or an accomplished craftsman.

Texture

There are two meanings to the word texture. It can mean either the exact representation of a fabric with every thread stealing in and out, or it can mean a peculiar method of handling the surface of a work of art.

Characteristic of Photography

The first can in no other art be so easily attained as in photography. The camera is all too accurate. It even exaggerates at times absolutely unnecessary details. The photographer is apt to consider this a grievous shortcoming of the medium he is compelled to

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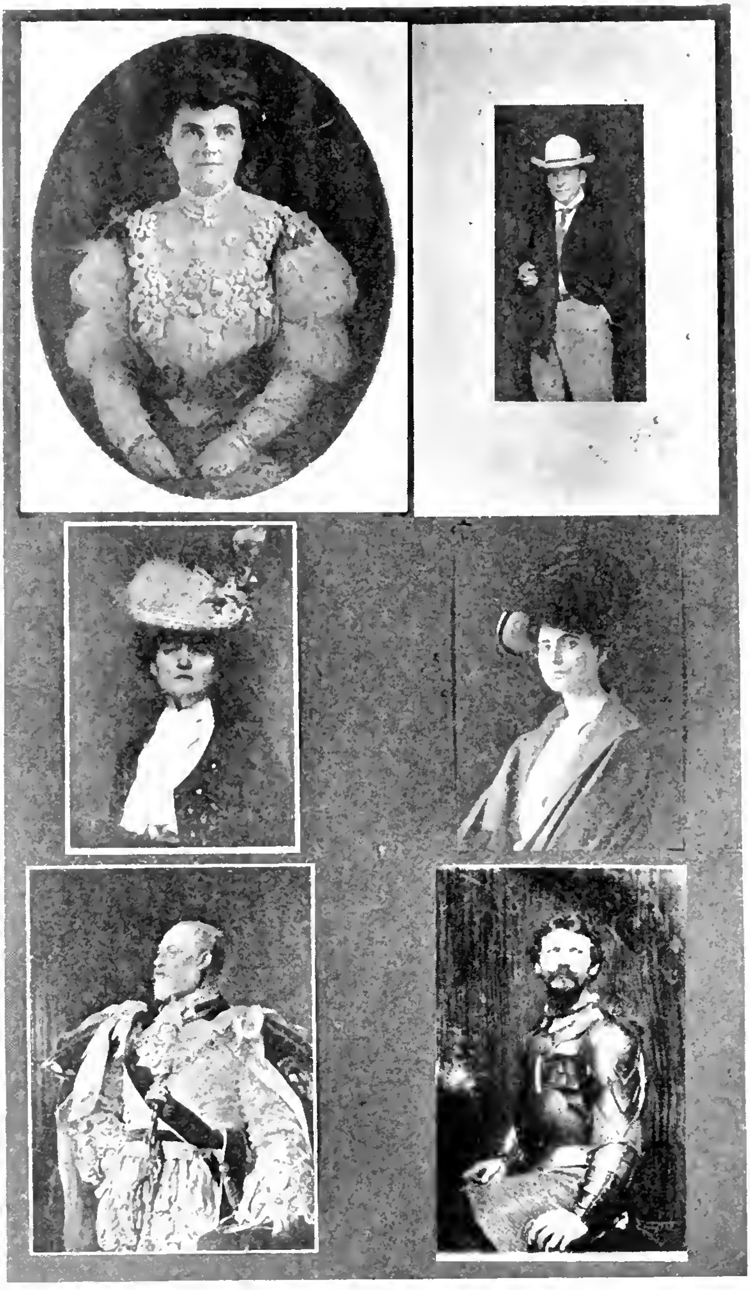

Plate VII. Figs. 26, 27, 28, 29, 30, 31. Read left to right. No. 26, copyright, 1905, by J. C. Strauss

work in. I am of a different opinion. I think it offers a wide field to the ingenuity of a thinking mind; as it can be used to good advantage in all work when modification and suppression are applied, it could help the composition and enable one to obtain Whistleresque effects, —that is, exaggerating details here and scorning them there. I have never yet seen velvet, satin or silk as realistically and beautifully represented in photography as for instance, in paintings. Craig Annan almost succeeded in his "Little Princess" (Fig. 10, Plate III), but the average photographer absolutely fails in this.

Representing Materials

In Plate VII we have several excellent examples of photographic representation of texture.

Eugene, in his "Portrait of Miss Jones" (Fig. 28), is quite successful in suggesting material. There one feels that the sleeve is made of some woolen fabric of a medium tint, the collar of some dark smooth cloth, and the vest of, what is called in the dry goods stores, piqué. Also Figs. 27 and 29 suggest the material most successfully. Notice particularly in "The Southern Type" (Fig. 29) the satin waist, the pearl embroidery, the shawl, the feather and ribbon of the hat.

Details

There are few pictures which offer such details without their being obtrusive as in Fig. 26. Here was a lady who desired a portrait of her new bodice in preference to herself, and the photographer obeyed the whim of his fair client. But it could be done so much more artistically as, for instance, in the portrait of King Edward, where court costume is about as elaborate and overembellished as any single suit of clothes can be. The rendering of the texture is naturally not quite so minute and scrupulous as the snowballs and leaves on the lady's waist in Fig. 26. Perfect clearness of detail, as it is wanted for advertising purposes, can be true only as a record and never claim any artistic pretensions. The suggestion of texture is desirable only when subdued, as in Figs. 27, 28 and 29.

Texture in Painting

The second kind of texture is quite the fashion in certain photographic circles, at present.

Let me explain what the painter means by texture: an attractive brushwork, a certain peculiar way of laying on the colors different from the conventional academic ways. Nearly all the great painters of our age have developed a style of their own, which, in a sense, reflects their personality and is recognizable by the connoisseur at the first glance.

Mary Cassatt's Art

Look, for instance, at the painting of Mary Cassatt (Plate VIII). What an apparent waste of accidental touches, passing shimmers, speckles, flashes and other local impossibilities, appear in the picture. And yet each of these embellishing touches lends its value to the variety and comprehensiveness of the total effect. Unimportant as these technical details may seem, they really present the leading characteristics of modert art, for they lend virility to lines and masses. With their help the immobile becomes animated, the silent begins to speak, and the dull tones colorful in the extreme.

Eugene's Achievement

This Eugene has introduced into photography by the means of all sorts of furious manipulations on the plate, as shown in his "Man in Armor" (Fig. 31, Plate VII). It is an interesting innovation, but a very perilous one to imitators. Only men who have the training of a painter, as he has, can venture it without becoming hopelessly sloppy. He, himself, is at times more agreeable. Nevertheless, there was a decided demand for just such artistic effects as his process provides

Photography, by its very nature, implies a flat treatment; but who has not grown tired of the everlasting monotony of the general appearance of prints? They all seem alike. The artistic photographer realized this, and began experimenting with the gum, glycerine-platinum, and other processes, with printing on rough paper, etc. The result is a veritable deluge of peculiar prints, which look like etchings, mezzotints, wash drawings, or reproductions of paintings. And then, just at the right moment, Eugene appeared upon the scene and presented us genuine "texture." Although I do not endorse his etchings on the negative and daubing color on it, I must confess that it fills a long-felt want. It is not legitimate

from the "purist's" point of view, but that is the only fault one can find with it. Each of his prints shows how the most insignificant splash, thumbmark or jumble of oversketched lines often explains, suggests and interprets nature far more clearly and vividly than anything else could possibly do. Yes, it often tells more about a form than could be expressed with much more labor; there is a sort of language in his "scrawls" which enables the artist to convey a good deal to an intelligent person, already acquainted with the art of painting.

Hand Modification

His method is, of all methods of modification and supression, the most free; it offers slighter hindrance to the immediate expression than by other retouching processes; indeed, it is so perfectly free as to offer no delay or obstacle of any kind whatever. The slightest accent or deviation, even the most transient hesitation or trembling of the retoucher's hand, is at once registered. In a word, his daubs and lines are vital, and, as the eye sees them, it reads the varying thoughts and moods of the artist.

The mechanical shortcomings of photography are thereby partly overcome. Whether they should be overcome in such a manner is, however, an open question, which other practitioners have decided for themselves.

In my humble opinion this kind of texture is much more easily acquired by the simple use of rough papers, by embossing, chemical treatment, etc.

Contrast

Contrast is produced by an adequate juxtaposition of lighter and darker masses; and the best vehicle for its realization is a skilful manipulation of light and shade. It can also be realized by space arrangement, as for instance in Fig. 39 (Plate XI), but it is a rather crude attempt, and in most cases, after all, nothing but the balancing of a dark silhouette or planes against light.

Light and Shade

The subtle play of light and shade is much more effective. The Old Masters used it almost exclusively to produce contrast, which they considered one of the most important elements of pictorial art.

PLATE VIII. Fig. 32. Mother and child.—Cassatt

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Plate IX. Figs. 33, 34, 35, 36. Read left to right

They used with preference strong sunlight, and in all their pictures (Figs. 34, 35, 36, Plate IX) there is clear division of light and shade, as I have tried to show in the Diagram 15. In more recent portraiture this division

Diagram 15

is less palpable, largely due to the appliance of more subdued light. It would be difficult to produce a diagram of the Chardin picture. There is a strong effect of light and shade, but it is broken up by too many half-

tints. The Gerard portrait permits of such division (Diagram 16), but it is more the result of material than actual lighting (viz. Fig. 33, Plate IX).

In the modern tone picture, as previously proven, there is little room for contrast. Not that it is impossi-

Diagram 16

ble: the "Franz Hals Type" (Fig. 43, Plate XII), by Rose Clark and Elizabeth Flint Wade, is a tone picture that shows decided contrast; but it is produced largely by space arrangement, by the clever juxtaposition of a small white plane with three other almost uniform tints.

PLATE X. Fig. 37. Portrait.—Chardin

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PLATE XI Figs 38, 39, 40, 41. Read left to right

Decided Shadows

The photographer seems to be afraid of strong light that produces decided shadows. And, true enough, the play of pure sunlight is apt to produce a snapshotty effect, as in Fig. 41 (Plate XI). Also Fig. 40, which shows an attempt at strong and direct lighting, is not quite satisfactory. The effect is rather harsh. The transition from light to dark is too abrupt. "The Little Violinist" (Fig. 38, Plate XI), by Alice Austin, on the other hand, shows that direct lighting can be rendered artistically. She wisely placed a dark suit against a middle tint background and used the shadow, the darkest plane in the picture, as a uniting link between the other two tints. Few people seem to realize what a valuable part clearly outlined shadows could play in portraiture. In America nearly all figures are shadowless, and thereby lose many pictorial and picturesque possibilities.

Color Effects

In "The Painter," by Curtis Bell (Fig. 42, Plate XII), we have any amount of contrast, but it is badly managed. It is confusing and purely accidental.

Nevertheless we realize that only an amplitude of masses, broken by speckles, flashes, passing shimmers and accidental lights, can lend animation, virility and life to a picture. Contrast is to monochrome the same that color is to painting.

Range of Local Tints

Study, for instance, the "Meditation" (Fig. 45, Plate XII), by Graham Glen. Notice the range of tones in the straw hat with its chiffon embellishment and ribbons, in her face and hair, in the cuffs, in her sleeves and cape, and the arm-chair, each detail has, at close discrimination, an individual local tint. One can guess almost the color of each separate part. And yet it is merely the reproduction of a painting. Could it not be possible to do the same in photography? To know exactly how every color effect in real life will look on the plate, to arrange all details accordingly, and by such a juxtaposition of lighter and darker tones to attain a scheme of color which will suggest color. This is not so difficult as it may seem. We can often feel color in monochrome works.

Side-Light Contrast is easiest produced by side-light, as seen in the Rembrandt (Fig. 36, Plate IX). That is the most natural way. But it can also be produced artificially, by placing a few shapes of a decided tint—that generally occupy the smallest part of the picture—in such a way that they give the key-note to the general effect (viz., Figs. 44, 46, Plate XI, 38, Plate XI). In "The Mexican," by Sarah Sears (Fig. 44), it is the scarf which scarcely occupies the fiftieth part of the entire picture. And yet it produces contrast. In Fig. 46 (Plate XII) we have the collar and cuff, a mere touch of pure white against the face and hand. In Fig. 38 (Plate XI) the face itself and the hands (as they should do in normal portraiture) furnish the leading color note.

Chardin's Arrangement In these days of slight differentiation and brown and gray monotones, even this primitive way of producing contrast would come as a relief. But, if we are more ambitious, we should strive for that finer sense of contrast which we see in the Chardin portrait, (Plate X). There we have several larger distinct planes, but each one is broken up by an endless variety of tints showing the entire garment from black to white. There are in the face shadows as dark as in any other part of the picture, and yet the face gives the impression of one luminous plane. If you would try and put a spot as white as the scarf on the face of "The Mexican" (Fig. 44, Plate XII), the whole composition would fall to pieces.

Accessories Accessories are really unnecessary adjuncts to a portrait. They sometimes enhance the pictorial effect, but the less there are of them the better it is for the portrait.

This is particularly the case in a bust portrait. The person itself, the face and the body in a natural, graceful pose, should prove amply sufficient. Yet if one takes many portraits one easily falls into a rut. To avoid monotony, the photographer looks around for new possibilities and finds an amiable helpmate in accessories. But I still assert that they are best avoided in bust portraits. In sitting or standing figures, it is a different

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PLATE XII. Figs. 42, 43, 44, 45, 46, 47, 48. Read left to right

Plate XIII. Figs. 49, 50, 51. Read from left to right

matter. A bust portrait explains itself. It is supposed to be a delineation of the face and nothing else. Looking at a full-length figure, unless standing absolutely naturally, as for instance Chase's portrait (Fig. 20), we begin to wonder why it is in such or such an attitude some accessory may be necessary.

How to Select

In the selection of accessories, the principal care should be that they simply help the figure to express itself more clearly, and that they are in no way obtrusive and do not attract an undue share of attention.

We all have grown a little tired of women that look like fashion-plates, and whose faces are subordinated to their gowns. This is almost the case in Fig. 50 (Plate XIII), although it is painted by Peter Paul Rubens, which shows that even acknowledged masters are not infallible, and that everybody must follow his own taste.

Obtrusive Details

It is one of the disadvantages of photography that details are so inflexible, so insistent in photography. We often run across a portrait representing a lady in a large picture hat, where the technical effects in the hat are so elaborate that the hat becomes the principal attraction. And, no matter how transparent the shadow of the brim may be, and how well the rest of the face may be modeled, the impression one receives is not that of the portrait of the lady, but rather that of a hat.

Home Portraits

Home portraiture, or placing the sitter in the surroundings in which he is used to move, is trying hard to replace the old-time painted studio background, which was incongruous in every respect. But cannot the same be said of home backgrounds? Where do we find truly tasteful interiors that are photographic at the same time? Furthermore, the light is so uncertain, and uncontrollable in nine out of ten cases. Apart from all this, a background as shown in Fig. 54 (Plate XIV), no matter how well taken, is really not more artistic than a plain one. It also leads the photographer into all sorts of temptations. He sees a fascinating pose as, for instance, Fig. 53 (Plate XIV), and takes it. The result is no longer a portrait, but a story-telling-picture.

Must Serve a Purpose

Accessories are really desirable only when they mean something, without detracting the interest from the face. In costume pictures, like Figs. 47 (Plate XII) and 51 (Plate XIII), they have a place. There they serve a special purpose. This is the case in Ruf's German student picture (Fig. 56, Plate XIV). He is the ensign bearer of his corps, and the flag, therefore, helps to bring out special points of interest about this particular young man. This can be overdone. Fig. 48 (Plate XII) is a good picture of a pyrographer; it depicts his trade in a simple pictorial manner, there is no fault to be found with it, and yet, to express the correct attitude of the body bending over the work, the head is turned a trifle too much, and the portrait of the old gentleman suffers thereby.

In Fig. 52 Plate XIV we have a man reading. There are entirely too many books around him. The parallel lines in the background irritate and disturb the effect.

Simplicity

No, it is my contention that the simpler the background, and the less accessories are used, the better the portrait will fare. Only accessories that are absolutely natural, as, for instance, a baby's carriage in a child's picture (Fig. 49, Plate XIII), a man leaning on a cane, a woman holding a bunch of flowers or a fan, or, as it may be, opening her parasol (Fig. 55, Plate XIV), are essential or desirable.

In group portraits, as in Fig. 57 (Plate XIV), a point of interest is generally deemed necessary, and in most cases it is. The arrangement of the different figures becomes much easier thereby. The five architects in the Held picture (Fig. 57, Plate XIV) are well handled, their interest in the miniature model of a building explains itself and their poses are animated and natural. Even the chair in this case proves to be a useful accessory, as it helps to lend atmosphere and depth.

Character

In contemplating a picture that appeals to us, not only do we weave pleasurable thoughts around the subject, but also are drawn to conjecture upon the personality of the author.

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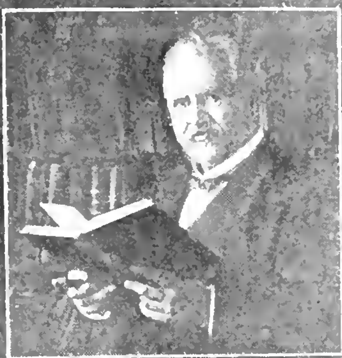

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PLATE XIV. Figs. 52, 53, 54, 55, 56, 57. Read left to right

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PLATE XV. Figs. 58, 59, 60, 61, 62. Read left to right

But who, looking at an ordinary photographic portrait, feels sufficiently interested to try and carry his thoughts back and beyond that record of features, which is of interest only to the inner circles of the family, of friends and acquaintances?

A portrait like Fig. 41 (Plate XI) or Fig. 60 (Plate XV), surely makes no appeal and awakens no response. Only when it represents a pretty woman or child, an interesting personality (Fig. 39, Plate XI, or Fig. 58, Plate XV), or typical character (Figs. 61, 62, Plate XV), or when it is so beautifully arranged (Fig. 59, Plate XV) that we forget the sitter and admire it for artistic reasons, do we become interested.

This is what I mean by character. A photographic portrait must have character, either through the attractive appearance of the sitter or through the conception of the operator's mind, or it remains a bald, unfeeling statement of fact.

The Essential Thing

And this really represents the most difficult problem in portraiture. The essential thing in a portrait is, after all, the face. We realize that everything else should be subordinated to it. But what is to be done should the face, as is so often the case, be devoid of interest? It has been asserted that no face is really without interest, that there are moments when even the most commonplace expression grows beautiful. This may be true. None of the people depicted on Plate XV can claim a great amount of beauty, but in each case the painter or photographer has succeeded in expressing character.

Here the photographer is at a decided disadvantage with the painter. He cannot command numerous sittings, and study his subject at leisure, as the painter; he has to rely on his general judgment.

The Rights of Patrons

And there is still another difficulty. A portrait is made to please, no matter whether made by an amateur or a professional. The portraitist has to obey the whims of the sitter. Of course, he can assert his rights as an artist, and experiment, but he can feel assured that the public will not approve his individual and artistic interpretations. They want something they can understand at the

first glance. To them a portrait serves a utilitarian purpose. The question which interests them most is whether the picture is a good likeness or not. By this verdict, in their eyes, stands or falls the merit of the picture. And the position the public takes in the matter is a perfectly sane one. People want to see their friends as they know them, in the ordinary dress and surroundings in which they are used to see them, and not wrapped in queer drapery, drowned in some brownish tint. There has been a little too much of that sort of thing of late.

Portrait or Study

If we photograph a person, we should be absolutely certain whether we want to make a portrait or a fancy study. If it be the latter, we can freely follow our fancy and make pictures like Figs. 6, 7, 10 (Plates II and III), for instance. But if we want a portrait, we must first of all get a likeness,—of course trying to make it as artistic as possible under the circumstances.

We all have seen in our experience portraits that are technically good and are printed from an excellent negative, with all the details faithfully reproduced and conscientiously worked out, but yet withal may be found painfully uninteresting. The advanced photographer says that this is because the composition is uninteresting or badly chosen. I am of the opinion that it is by far oftener the case that the subject has been so uninteresting that nothing could be done with it, or, what is more plausible, that the photographer did not get interested in the sitter sufficiently to bring his best faculties into play during the sitting.

Character Reading

The trouble is that most portrait photographers are not efficient character readers. A portrait photographer should, above all else, be versed in the knowledge of human nature. He should have the changes of physiognomy, the ranges of external appearance at his beck and call.

Fugitive Expressions

Every human face has hundreds of fugitive expressions, and the photographer can record only one. And some are so subtle and so unusual that they almost distort the features, notwithstanding that they may be perfectly accurate. No matter how intimately we may be ac-

quainted with a person, it is well nigh impossible to compete with the camera and discover all the variations of a sitter's facial expressions. It is at this point that the genius of the portrait photographer comes in,—his ability to read character, to reflect through external appearance the disposition of the sitter.

Examples

Let us see, in Plate XVI, how far various photographers have succeeded with the author of this monograph. Kajiwara, of St. Louis, made me look like a young matinée hero (Fig. 63). He met me accidentally and at once photographed me. He slightly accentuated my foreign birth, and tried to make me look handsome by removing all the structural peculiarities of my face. Miss Buehrman, in Fig. 64, shows an utter disregard for likeness. She is a disciple of Coburn, and simply cares for decorative effect and blurred tonality. Fig. 66, by Strauss, is a portrait that I personally like. He makes me look like a man of the world. It is just the way I often sat in his studio, a cigar in my mouth, and cleaning my glasses with my handkerchief. It is in no way typical, but a good, accurate expression of a momentary mood. A less subtle and more stereotyped professor-like expression we notice in the Parkinson portrait (Fig. 65). The painted-in background is one of the incongruities for which there is no excuse. A typical and much-liked portrait is that by Zaida Ben Yusuf (Fig. 67). It is simpler in treatment and has more character than any of the others. Falk, with whom I am fairly well acquainted, depicted the Bohemian element in me (Fig. 68), and the picture has been repeatedly taken for a portrayal of "The Beloved Vagabond." The most satisfactory portrait to me personally is perhaps Fig. 69, taken by an amateur. It is a good likeness and well posed, at least, in the upper part of the body.

Each of these pictures has a distinct facial expression different to all the others, and yet people who know me would recognize me in every one. This shows what individual interpretation will do. Each of these photographers had a vague conception of my personality, and portrayed me from the viewpoint which he knew best.

They are all portraits except Fig. 64; while artistic

63 64

65 66

67 68 69

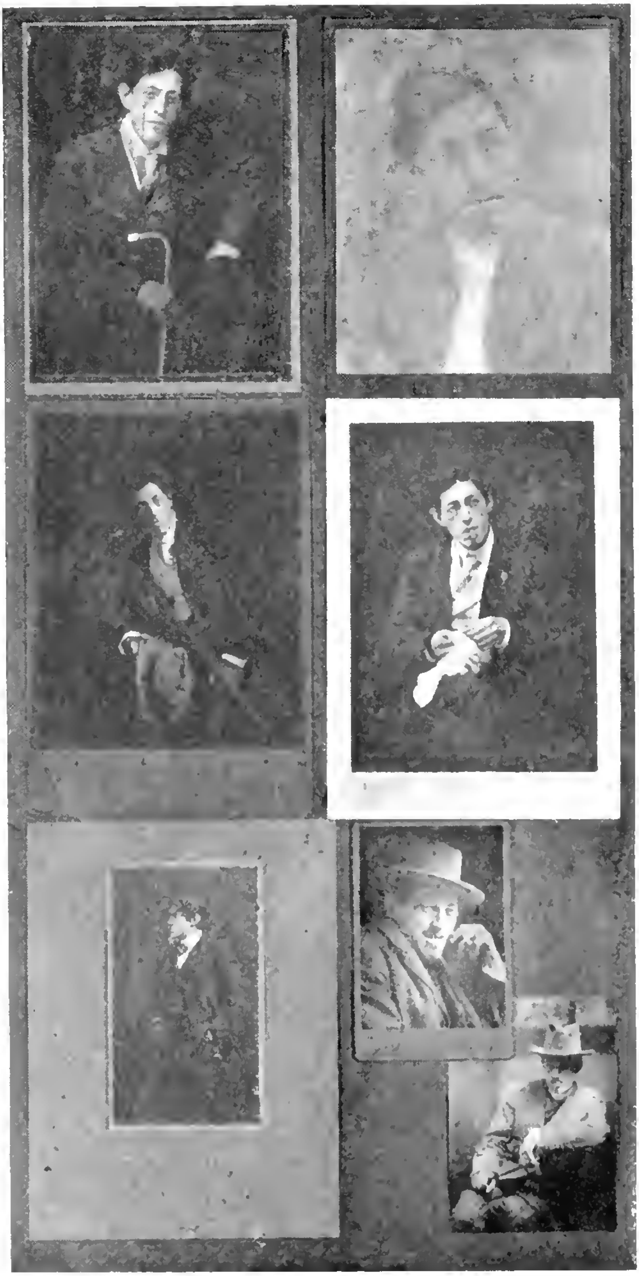

PLATE XVI. Portraits of Sadakichi Hartmann. Figs. 63, 64, 65, 66, 67, 68, 69. Read left to right

pretensions can be claimed only by Figs. 64, 66 and 67. For this reason Figs. 66 and 67 win out, as they are a combination of both.

Painter and Photographer

Portraiture as it is practised today, even at its very best, is nothing but an esthetic enjoyment for the few who like to see a personality delineated as another personality sees it. The pride and surprise of performance has become the predominent quality—and the note of psychology--the record of the inner life of man in contrast to outward appearance—is lacking.

The painter is too much absorbed in the individuality of brushwork, in the color scheme and composition, in the effect, perchance, of some passing light, to give due attention to the delineation of character. Of course there are exceptions, like Watts and Lenbach, who understand to blend character with artistic qualities. But the technique of the painter is inseparable from the conception of his mind, and the stronger his personality is the more active will his imagination be in the presence of an interesting sitter. He unconsciously will give his own interpretation to the features and forms before him, and the result will be a commentary on them, rather than an accurate representation of the same.

This medium of expression is a too conscious one; the action of the hand is too closely connected with the activity of the brain to grasp objective phenomena, and the likeness they render is never a likeness *per se*, but likeness as seen through another temperament. Many of the leading painters have realized this deficiency and tried to substitute it by a more mechanical registration of facts. They have welcomed the camera as an obliging assistant to overcome the difficulties of actual structure in delineation.

An Independent Recorder

Photography is the one medium of pictorial expression which records independently—without any immediate influence of the brain activity of its manipulator. Only the selection of subject is under control; what it is asked to represent it represents mechanically and with vivid accuracy. And it is one of those inexplicable cases of

human short-sightedness that the craftsmen of the camera have not recognized the fact that the originality of camera expression is dependent,—not stands or falls with the one quality of independent registration. Instead of blindly imitating the formulæ of other arts, they should have recognized that their technical means were capable of a new style of expression.

The Decisive Moment

The photographer can devote his entire knowledge, clear vision, sympathetic appreciation, alertness in seizing upon the characteristic elements that best reveal the sitter,—in short, all the qualities which constitute genius in a painter—to the arrangement and investigation and full comprehension of his subject, leaving the labor of actual representation to a mechanical process of reproduction. He can give full sway to individuality of selection.

Each sitter should be a new problem, a new mystery that you have to study and experiment with in order to solve and unravel it. Whenever you photograph a human face, you should come back refreshed and enriched as with a new experience.

This touch of sympathetic understanding is, after all, the principal thing in portraiture. Without it, a picture, no matter how artistic, must be dull and uninteresting.

I am not one of those critics who persist in thinking and saying that only one method is right or wrong. There is, no doubt, room for all sorts of opinions. Who shall say which one is correct? The best I can do is to give frankly my own personal conclusion.

What We Most Need

It seems to me, what we need most in photography, at present, are workers who will open fresh paths from the eternal avenues of sameness so inveterately pursued for years; pioneers who will daringly push their work beyond the ordinary, and not mind the criticisms that may be poured upon them from the ignorant and the old-fashioned.

For all we expect of an artist or craftsman is to find a style of utterance which is intrinsically his own, and, after finding it, to practise it to its best advantage and utmost capacity.

Sadakichi Hartmann.

Children at Play
Katharine S. Stanbery

[Print from the saved negative. See page 5[illegible]3]

The Photo-Miniature
A Magazine of Photographic Information
EDITED BY JOHN A. TENNANT

Volume VIII DECEMBER, 1908 Number 96

Leaves from an Amateur's Note-Book

The contents of this book are not meant to stand for a text-book of photography in any sense, they are only a collection of an amateur's cursory notes, presented in the form of suggestions to other workers. These notes do not touch over one-twentieth—one-hundredth—of the ground photographic; nor is what I have said on any subject either exhaustive or authoritative. I take it for granted that in most cases I am addressing workers who know as much as I do about the various phases of the work, technical and artistic—in many cases more; and that it is not necessary to speak of the many processes which we all take as matters of course. But I have been moved to note down my own experiences and experiments where they have differed from those of others, and to put in occasional words of warning about common observances which we are all apt to forget or to neglect: About these I always speak from bitter experience.

I claim no technical education nor proficiency, having depended only on experiments, mistakes, reading and the suggestions of others for what I know. I began "at the bottom of the ladder," with a small twelve-dollar kodak and very vague notions of what I was doing; and I feel that I am still much nearer the bottom than the top.

If any one suspects that I am working too much by

line and rule, and am cultivating technique and mechanical precision to the extreme, I can only assure him of the simplicity and casualness of my photographic life, the absence of paraphernalia, the few processes that I confine to my dark-room, and the wild frenzy of printing I sometimes get into, in which, not having reduced the process to an exact and absolute science, I waste as much paper, occasionally, as the newest beginner. This does not discourage me always: it makes me feel a little less like a machine.

I hope I may be permitted to make the following statement. For the amateur who makes pictures only—as a painter puts on canvas what he feels—a simple technique is advisable: Few processes, that his inspiration and spirit may be left freer and clearer. But that technique should be at least sure, and his education, along whatever lines he may need, of the best; and I do believe that the very best education is to be had from the files of THE PHOTO-MINIATURE: It is a university, in which you may take any course you choose.

The Amateur's Dilemma

It is not an easy thing for an amateur of any sort to keep in just the place he wants to be in. If he works hard enough and turns out enough produce of his brain or hand to keep constantly in the eyes of the public, or even of the critics, he becomes almost a professional, and runs the danger, through his prolific output, of losing some of his finer purity of inspiration; for it is a truth, that occasional amateurs do produce, *sometimes*, the rarest and most inspired dramas, poems, songs, paintings and photographs. Perhaps they are not moved to bring forth many; they wait until a voice actually prompts them to speak or to create, at rare intervals. Yet they know that they can never make great names for themselves in this way: the public and the critic demand frequency of expression before they will consider a man's art, seriously.

If the artist or the poet harnesses his Pegasus to plow his fields and earn his bread for him, he must learn to live his work-a-day life in his realms of dreams. The very frequency and habit of his work may bring him fresh impetus and inspiration, but he will have to train

and force his moods and his nerves, and possibly repress some of his emotion in the conception of a work.

Spontaneity

Often, in looking at the works of a painter (other than of portraits, I mean), I wonder how much of it is really spontaneous. One is noted for his forest scenes—more particularly, beech trees—and these he sells for good sums. Consequently, he turns out beech forests with great frequency, and they are all different and all good; but how many of them, I wonder, did he want and long to paint? Another does marines, with a passion for fishing fleets. He paints his boats in every conceivable position, grouping and lighting, and in every kind of weather; and they are all works of art. But if he were purely an amateur, say a business or professional man, with the same ability to paint well and the same love for it, and spending his summer by the sea, how many fishing fleets would he paint—more than three or four, anyway? How many of the great modern canvases—landscape, genre, decorative—so many of them manifold expressions of the painters' genius, would now be extant, had there been no public and no critics? I have excepted portrait painting because that on its face is usually but the supply answering a demand. I am not deprecating the professional: but he misses something of the luxury of the occasional fine frenzy of the amateur.

What I have said of art, in general, is true to a great extent of photography, in particular. The difference is that the amateur photographer (I am using the term now as applying to the school and style of his art, and not to his standing outside the ranks of bread-winners) does not, unless he be a portrait-maker, have much of a sale for his pictures, anyway. The time has not yet come when the public will buy photographic figure-pieces, genre pictures or landscapes, at prices from ten to a hundred dollars or more, to hang upon their walls. Heaven speed the day! But, in the meantime, the amateur is more or less an artist who is something else beside: either he is a man of leisure and has an income, or he keeps a Norman plow-horse to till his fields by day, that he may afford a Pegasus on which to fly by night in the land of his dreams.

Even then, his fellow artists have no very high opinion of his genius if his pictures are few and far between. If he is a temperamental man, what is he going to do? Force his moods? Send out his camera under all sorts of conditions, seeking whom it may devour, just in order to get enough new pictures for the annual Secession exhibition or picture-shows in various parts of the world? If he does not, his critics and fellow-workers are apt to say: "Oh, he's falling behind; he used to do pretty good work, but he's about out of the running, now." And they will not let him live on any past glory.

The Virtue of Necessity

I know that this influence is salutary and beneficent: necessity for recognition will spur many artists on to really good work—better than they would have done if allowed to stagnate. I am not complaining of existing conditions: I do believe in fanning the flame of — — genius, or whatever else it may be. I am only sorry that the occasional effort of the artist is so soon forgotten by his contemporaries.

Over-production an Evil

At any rate, to apply these general theories of art to photography, one of the evils to be guarded against is *over-production*. Make many pictures—yes; but not too many. Do not photograph one person, one scene, one accessory too many times. Suppose you have a model who is intelligent, responsive, expressive—everything that is to be desired of your heart. But suppose that—say twenty-five pictures find their way during the year to exhibitions, in which this one man or woman figures: portraits, story-pictures, character studies. And then suppose that the twenty-sixth picture is your effort to express some great romantic emotion, some psychological truth, and yet the familiar features of this same man or woman shine out from the frame like an old friend. Don't you think that picture would lose just a little of its force with the critics of really deep understanding and feeling? They could not get away from the model: it would be worse than seeing the same stock company week after week in a varied repertoire, when you would be sure to recognize the actor and not Hamlet. It is almost the same with scenery (especially as an adjunct to figures), and with favorite chairs, window-seats, etc.

"Maria Bonaventura"
Katharine S. Stanbery

The Little Brother and Sister
Katharine S. Stanbery

Weeding Things Out

Do not economize on your models, and do vary your actors and stage settings. And do not, if you have to make many studies to arrive at one picture that suits you, show all of those stepping-stones, even in private view. It is appalling how the many studies weaken each other when they are all seen. They may be good, all of them, but the artist ought to be self-sacrificing enough to weed them out and retain only the one that best expresses his aim and thought—or at most, two, and those not conflicting. I have in my mind individual cases of most of these painters' and photographers' tendencies, but of course they are not to be cited.

It is all very well to remind one's self that the old masters of painting kept their cartoons, and that these now often sell for very high prices. Very well; but if I were a painter, cartoons and studies should be destroyed as soon as their purpose was served. Or even excusing them: they, as mere sketches and fragmentary studies, show what they are beside the big and complete picture; while an attempt or previous study with the camera is necessarily a picture in itself.

I have said these things because I believe that the careful and reverent tending of the seven lamps is the only way by which photography is to be elevated to a plane of dignity with the other arts.

Realism vs. Suggestion

You remember one of the lamps of architecture is Truth. Of photography, too, I beg of you. By this bright flame the amateur is, or should be, separated from the professional and his theatrical make-shifts. Yet, exactly to define just what this Truth is, is not very easy: perhaps the term is somewhat elastic. We know that it does not mean painted backgrounds and imitation accessories; but yet it cannot mean always the real, identical thing that the picture is supposed to represent. I am speaking of genre work, now, of course, and I know what a difficult subject it is. Indeed, some critics claim that it should be excluded entirely from photography, and I do not know but what, in principle, they are nearly right. Still, the modern way of making pictures has so far eliminated the stern realism of the camera that they can

scarcely deny to us the use of the lens as an instrument in producing pure creations of fancy, and in telling stories. But once using that privilege, we must remember to subordinate realism (of technique) to suggestion, else our pictures will have a commercial look and savor always, always of the stage settings and the model.

For Example It is not an artistic crime to illustrate a fairy tale with photographs; but they must be made with discretion. If you make "Hop-o'-my-Thumb" pictures out in the woods, and put costumes on your little people, that is all right; the woods are there, and they are very real, and, if you are not too stern a materialist, you may get a romantic, suggestive picture that will also be truthful.

If you are going to illustrate the Perrault version of "Cinderella," you will have a different problem to meet. You haven't any glittering palace to take your camera to, and you haven't any docile rats and mice, even if you could conjure up a pumpkin on wheels; and so what are you going to do? If you were a vitascope photographer you would get painted scenery for your palace, and—well, I don't know what you might not resort to for your menagerie; but that would be a photographic and artistic lie—making the imitation pose for the real. So there would be only two alternatives: either let "Cinderella" go without pictures, or photograph your models with little or no background, merely a suggestion of light and shade—just a strong impression or outlining of character, if you will. I know it is hard enough to get even these indefinite backgrounds, sometimes, in our modern and detailed surroundings; you will have to adapt yourself to circumstances, often and often; oftener still, to give up your dream.

Nor do I mean that everything must be actually there that we see or feel in the picture. If, with a darkened room and simple doorway and some great stone jars, you could, by suppressing all detail and working in masses of light and shade, succeed in getting a picture of Morgiana pouring boiling oil on the forty thieves, it would by no means be necessary to have real boiling oil in her vessel, nor a man inside every jar, but it would be necessary to have real jars no matter how real might be

the effect of painted jars in the dim light, it would be a lie to have anything but the actual vessels—or at least something in the round. It is not necessary to go into the reasons for this—every artist knows why.

I would not hesitate to take a picture of a woman draped in any material whatever—cheesecloth, linen, a ragged silk dressing-gown—anything at all that made the proper lines and the proper light and shade; if my object was merely a study, and I could so obscure the material that it would not obtrude itself nor be anything but part of the figure drawing. But, if I were going to make a picture of a queen—to illustrate an idea, and had my choice between no ermine at all and cotton wadding marked with black, I would choose no ermine at all, no matter how startlingly real the substitute might look.

Well, these things are idiosyncrasies, and every one must decide for himself; with the photographers it is a weighty decision; with the painters it scarcely counts.

My Apparatus

I have three cameras. One, a folding Kodak, fitted with a Goerz Dagor lens, and a Goerz Sector shutter. This holds films only. Another is a 5- by 7-inch Premo, fitted with a Zeiss Anastigmat, Series II,A; this has no extension bellows, and I use it chiefly for small figure pieces and small landscapes. The third, the one I use for my general work, is the laughing stock, both as to body and as to lens, of some of my Secession friends. The camera is a Folmer and Schwing Graflex, fitted with "all modern conveniences," and weighing (I ought to blush to tell it) seventeen pounds. The lens is a Goerz Double Anastigmat, Series III, number 6, covering a 10- by 12-inch plate, though the camera holds 8- by 10-inch plates. The shutter (which I have lately practically given up) is one very much like the Sector, also of Goerz make, operating with a bulb and opening to U. S. No. 3. These brother artists tell me that the magnificent box is a superfluity and almost impossible to manage in the open (some of them have carried it for me); and that the lens is too fine and scientific to do the best work; and that I should be so much better off with a nice, cheap, single lens, which I might be able to get for $30 or less, and which would do flat, artistic work for me. Now I know

that this is every word true, and I do not feel any tinge of superiority when I apologize for my outfit. But—it was given to me, several years ago, by a member of the family who was scientific, and who believed that the most accurate is always the best.

Managing a Lens

Well, I do the best I can with my material. I move the seventeen pounds about without complaint, and sometimes I am very, very thankful for the double swing-back and the sliding and lifting front and the long bellows that account for the weight; also for the clear, correct lens, which I have really learned to love. I have learned to manage it, too; I seldom use more than the back lens alone, for either landscape or figure work, and if I feel that it is going to model my figures too much in the round, I try to correct this with lighting. For years I resorted to the usual method of throwing my principal object out of focus, which will not only dim, but flatten it. But that was unsatisfactory, as some other part was almost sure to come into focus and make a discrepancy. But now I have discovered a new remedy—a joy and a delight. When I first got the lens, it came in a shutter folding just like a Sector, but working by hand, with no release or automatic movement, and depending on a cap. I got this out recently and discovered that it opened to U. S. 2.9. Oh what a difference that one-tenth does make! I use it altogether now, for indoor work, set it at U. S. 3 to secure a fairly defined focus; then I open it to U. S. 2.9 and get a perfectly defined image, but soft and somewhat diffused, and vibrating—even tremulous—in the light. How I regret the years that this tube and shutter (they were even mounted on an adjustable front) lay packed away unappreciated! Yet I can't use them out-of-doors, because there is only a cap to work with!

But I must qualify even the foregoing by saying that even Secessionists sometimes want sharp, well-defined outlines; a good focus is not necessarily a disgrace.

Making Portraits

Then I have to contend with limited space for portraiture. In the first place, I am not even a semi-professional, and have not a studio; I am only an occasional picture

maker, either for exhibition work or for the sake of making portrait studies of my friends; so I just take the pictures where I can: Occasionally in other people's homes; more frequently in my own home, where the lighting is ordinary. My own study, where the green burlap walls are the darkest in the house, is a small room; but I twist and move the furniture (which is plain, if I do want to use it) until I get distance. I have two west windows, so that I have to choose a sunless time, though once in a long while a sun-flooded figure, showing the windows and the wall or the floor, is a real joy. Sometimes I can get a good effect with a figure in relief against light-colored walls far in the background; but anything more than a slight suggestion of pattern in wall-paper is not to be tolerated.

Lighting

Always, always the lighting is natural. The only concession I make is to run the shades up and pull the curtains back. I never screen the lower part of the window, for that would be an artifice and defeat the end for which I work in the picture. Of course, opinions will differ as to the result. A painter, not long ago, took me severely to task for this, saying that I ought to let all my lighting "work up to the face," invariably and without exception; but he seemed to be struggling in his mind with some old academic canons and laws about lighting (and composition), and would not recognize the wonderful naturalism that the camera has made into real art.

To be sure, this lighting has its dangers. If a woman has on a light dress and the color of her hair doesn't contrast well with the background, and you happen to underexpose the plate a trifle, the result will be very depressing. In such a case, I have learned to expose for every bit of light there is in the face and hair, and then to develop the plate weakly and slowly enough to keep the pictures fairly flat, but not enough to destroy the shadows in the white drapery. An underexposed plate will make the face dark.

About Developers

As to developers. I have gone through pyro, hydroquinone and amidol, and I have arrived at rodinal, where I mean to stay. The others have to be mixed somewhat laboriously,

always demanding an alkali, and they stain the fingers—the first two horribly. Rodinal comes as a liquid in a bottle, keeping indefinitely, and all you have to do is to pour a little in a measuring glass with a large quantity of water (I will give proportions later), and there it is. There is no alkali needed, and the gradation of tones is beautiful, and very — — versatile, I might call it. Beside the trouble of mixing (and sometimes cooking) the other developers, it occasionally happens that you are in an emotional or an obsessed mood when you make a certain picture—perhaps a very sad one; and you will be thankful enough to have as few processes and technicalities as possible stand between the exposure and the finished prints. The always-ready tank of acid-fixing bath is a great help in this way.

And Developing

Now as to the process of developing. But the subject begins properly with that of exposure. When I speak of normal, under- and over-exposure, and normal, under- and over-development, of course I mean that one governs the other and is to be judged and named by the other. A normal negative may have been under-exposed but saved by weak development; an under-exposed negative may have been exposed for a really generous time, but ruined by an abnormally strong developer. And so forth. So I cannot use any exact formula. But I will quote some of the things that actually happen in my experience. Suppose, for instance, that I have a figure in medium-dark drapery posed in my study (the walls are dark green), against or almost against the wall opposite the windows—some fifteen feet away and with the double lens, on a fairly bright day, I would generally give about eight seconds: With the single lens (it is almost always single with me), about sixteen seconds. When I came to develop, I would use about one part of rodinal to sixty-four parts of water; that is, water, 8 ounces, rodinal, 1 dram. If for some reason I had exposed twenty seconds or more, I would make the proportions about thirty-two parts rodinal to one of water. If my model got unsteady and I had to shut off the exposure at eight seconds or so, I would coax out the image with a developer at about 128 to 1. You notice that

"It's the Heavy Sorrow that's on me"
Katharine S. Stanbery

The Edge of the Wood
Katharine S. Stanbery

I say "about," that is a beauty of rodinal, and fortunately; for if you find an under- or over-exposure, after starting with a medium developer, you can pour in more water or drop in more rodinal (first taking out your plate in the latter case), without measuring. I use the scale of figures, 8, 16, 32, 64, etcetera, to make drams and ounces correspond. Rodinal development must be carried pretty far, especially as it loses a little in the fixing-bath. An under-exposed negative may be brought out in a weak developer and afterwards transferred to a strong bath—say 16 to 1—for a few minutes. Care must be taken, however, not to cloud the transparent shadows; or the negative may be afterwards intensified.

An over-exposure, as every one knows, is only to be saved by the very strongest development, carried to the limit of bringing out every detail; afterwards, if the plate be unprintable, it may be reduced. Some workers, I know, use potassium bromide as a restrainer; but while I have been known to try it, and while I keep a bottle ready for some fearful emergency, I seldom or never touch it, as I always fear its restraining powers in the shadows and never feel safe in using it.

An Experience

Apropos of under-exposure. A year ago I was spending a day in the country, and had my 3¼- by 4¼-inch kodak with me. Among the tall trees, four children were playing "Pussy wants a Corner." They were charmingly unconscious, and the composition was beautiful. But the trees made it so dark and they were running so quickly that I knew I was almost doomed to failure, yet I decided to try it. I opened the aperture wide (U. S. 2.9), set the shutter at $\frac{1}{150}$ sec. (the fastest), and made the exposure at a crucial moment. When I came home, I carefully cut that film from the rest of the roll, and put it to soak in a tray of water. Very soon I added a few drops of rodinal; the proportion was infinitesimal—it could not have been more than 800 to 1. I rocked this gently a little while, and then left it in a place away from the ruby light while I developed my other pictures—about fifteen or twenty minutes. At the end of this time the film was still perfectly white. Then I immersed it in a rodinal solution, 64 to 1 and developed it, the result was

too good to be true. Brilliant lighting and definition and detail in every leaf, and a beautiful picture. With the light there had been and ordinary development, it would have needed at least ½-second exposure, and the flight of the children would never have been caught.

After Remedies As to the reduction and intensification of plates. I have only to say that I stick to the good old formulae: mercury for intensification, ferricyanide of potash (Farmer's formula) for uniform reduction, and ammonium persulphate for reducing negatives that are too violent in contrast. I have tried some of the new mixtures on the market, and I have gone back with much relief to the old formulæ.

Intensifying When it is necessary to intensify a negative, the greatest care must be taken first to get out every trace of hyposulphite. I have, long ago, intensified a few plates in a hurry, only to find them, a year or two later, so faded, stained and spotted that it was absolutely impossible to get a print from them. A thorough washing (though not so long) is just as essential between the mercury and the ammonia baths. At this time the tap water should never run directly on the negative; if it does it will make a large, radiating pattern on the mercury coating, which will never come out, and which, of course, will print. After the immersion of the negative in the ammonia-water, only a short washing — for a minute, say—is necessary. An intensified plate dries much quicker than an original one, and may be subjected to a hotter current of air.

Local intensification or reduction is apt to be successful only when applied to parts having pretty well-defined outlines. In the case of reduction, the negative should be thoroughly saturated with water, but the surface moisture should be blotted off; during the process, however, frequent rinsings are desirable, that the outlines of the ferricyanide may not be too well defined for the negative; the work should be done with a brush.

In intensifying, the mercury may be applied to either a dry or a moist plate, as in the case of general intensification. But the greatest care and delicacy will be needed to make the correction look natural. Of course a vague,

unbounded area may be intensified or reduced; but then the skill would have to be very great indeed.

A Hint re Films

When you are developing films, either cut or in the strip, do not on any account, as you value your pictures, agitate them from side to side—not for two seconds, even. As sure as fate, if you do, fine black lines, parallel, will appear, running the length of the film; and as they are silver deposits, nothing on earth will remove them. The danger of this is greatest when the development is first commenced; it lessens toward the end of the operation, as all the silver is then properly disposed of. Still, it is a habit to be avoided at all times.

Forethought

When you are through taking a picture, whether with a focusing camera or with a kodak, be sure to restore the lens and the shutter to one condition: the largest opening for the lens and the fastest speed for the shutter. Also, if you do much outdoor work, see that the shutter is set automatically, or at the so-called "instantaneous" mark. These precautions may obviate some shocking mistakes of carelessness in your next picture.

In developing, printing, and especially in the preservation of negatives, it is impossible to be too clean. Have the backs of the negatives well washed, and keep them put away in envelopes, not stacked together without covering. I have seen valuable negatives, scratched and ruined for all time by such treatment.

Photographing a Child

If you want to photograph a young, active child, indoors, and with a single lens, you need good temper, patience, long suffering, many plates and superhuman ingenuity. Even then you may fail. I remember once when I conquered. The child—two and a half years old—was on her mother's lap, in the sunlight of a bright window. Yet I knew I needed (with the single lens) at least three seconds, even allowing for weak development. I might as well have asked for three hours. We *couldn't* get her still Toys, books, her mother's sewing, everything was tried; but her hands worked with incredible rapidity over everything she touched. It seemed impossible. Finally we worked out the following method: I

took a small brass bowl and in it pasted a strip of ribbon; over that, crosswise, another strip. Then I gave her the bowl. Of course she tried to pick the ribbon out, and — — of course it took time. The day was finally saved.

Groups

When you take groups of people, you will find that the heads of some of them are liable to be hid by others in front of them. Most people do not understand how to be seen in a group, and it is sometimes impossible to sight each face. Simply explain to them that each person must be able to see not only the lens but the whole camera, as far around it as possible, then every face will be clearly visible in the picture.

Enlarging from Prints

Some of the most beautiful landscapes, and occasionally figure-pictures and portraits, are made on small kodak films; and very often one wants to enlarge them. But if you send them away, you will get back just as many bromide enlargements as you order, and you can make no more; besides, while bromide pictures are pretty good in their way, they are not the thing that artists want. Possibly you can't enlarge your own negative (I can't, not having the proper equipment); and if you send the film away to have an enlarged negative made from it, that shuts the picture out of all exhibitions, as it will not be all your own work.

This is what I do. I make a clear, sharp print from the original on Solio or (preferably) Aristo-platino paper, and tone it and fix it to get all the brilliancy possible. (That is, sometimes—I must confess that I have worked from an untoned, untouched print, in not too strong a light.) Then I mount it, set it up in a proper light, and copy it with my big camera, with the double lens and the extension bellows, enlarging it just as much as I want to. By means of over- or under-exposure, I can get variations of contrast, often improving on the original picture. If there are defects in the original print, they must be touched out, if the paper will take the paint or pencil. For that reason Aristo is better than Solio—platinum better than either of these. If you use very smooth platinum and can get full, even lighting, no grain should show.

The directions for copying that are in No. 41 of THE PHOTO-MINIATURE are not to be improved upon; but there are make-shifts not mentioned there that may be valuable. For instance, very few people have the means of getting perfect lighting for the print from the front, or with artificial light. It is a good thing to do your copying outdoors, out of the sunlight. But often you cannot even do that. I know that my limitations have been such that I have generally been obliged to work between two windows, in a corner. Yet I have succeeded. The two windows, south and west, are each about three feet from the corner; between them stands a long cheval glass. This I turn with its back out, and against it I put a little stand, with a white cover. On this I set my mounted print, upside down, tilting the glass till I get the picture quite in a vertical line. Then I put my camera on another little table, the same height, and move it toward the print until, between adjusting the distance and the focus, I get an image of the desired size. Then I depend on my eye and great patience to get the print and the ground glass absolutely parallel.

This may sound pitifully clumsy to the accomplished copyist with sliding rack and adequate apparatus; but he might be thankful for it some day. The white cloth I spoke of throws up light on the print. I run up both blinds, yet even then it is hard to see the print clearly enough to focus it perfectly. Well, I generally work on a sunny morning, when the sunlight is coming in the south window in a shaft that does not come near the print. So I take an easel mirror (a 6-inch circle) and set it in this window so that it catches the light and throws it on the print in a bright spot. Then focusing is easy enough. Everything being ready, I remove the mirror, and, with lens stopped to—say U. S. 16, give an exposure of 30 seconds, developing with water and rodinal, about 1 to 32. (These figures are merely given as a possible basis; almost every print will differ from every other print in the length of exposure necessary, the stopping and the developing.) The print, being thus lighted from both sides and having reflected light from below, rarely shows any grain.

This manner of copying might not make mathemati-

cally accurate reproductions of scientific plans or drawings; but of *pictures* it will make such good copies that you will not realize any shortcomings. You see, the books are always full of the correct way to do things but we amateurs have to devise expedients or give up the work altogether, sometimes; and occasionally the expedients are just as good as the proper way. Reducing pictures and copying them on the same scale may of course be done in the same manner.

I have been scolded by other artists for this shocking way of making large pictures from small ones; it is most unscientific and inartistic and reprehensible. Well, I know it. I wouldn't do it if I knew how to make enlarged negatives. Besides, I have done so few, and only under stress of necessity, that it is not a habitual crime. At any rate, it is a method to be thankful for when everything else fails.

Retouching

I dislike to write about retouching, because it is the medicine of photography, and I do not, in theory, like medicine. But we all have to take it, sometimes, and of course one wants to take the right thing, though as little as possible. Just so, while we amateurs may condemn retouching as inartistic, there are certain phases of it that are absolutely indispensable, if one wishes to get decent prints out of certain defective negatives. I am even going to say boldly that it is not a bad thing to know how to retouch as the professionals do. To know how, I say, though only to use the technical methods in certain dire emergencies: never to imitate the results. The professionals first smear over every face (which, to begin with, has been focused to microscopic sharpness) with a dab of "retouching varnish," and work it in smoothly with the finger or a piece of cotton. When it is quite dry, they go to work on it with a finely pointed lead-pencil (generally, a hard one), and not only take out or soften every wrinkle and hollow or so-called "defect," but actually cover the whole face with a delicate little lace work, which is as much like the real skin as a snake skin or a piece of Brussels net would be. I have seen them work, and even pretended to learn how, once, under the guidance of a good one, and I know that their

claim, "that it is absolutely necessary, even with the smoothest skin," is pretty nearly valid, owing to their mania for the sharp focus, which makes the human skin show up like a section of limestone.

No, it is certainly unadvisable to do this sort of work, ever; but—let me cite a case.

How To Do It

You have made a portrait of a woman who has gone away and whom you cannot get again. When you develop and print the negative, you find that it was a trifle under exposed, with insufficient lighting on one side of the full face, though the details are there. Try as you will to vary your printing processes, each print looks ugly and forbidding on account of that one obscured cheek. If only there were a little light on it! Which would you rather do: abandon altogether a beautiful portrait, or resort to a little manipulation? If I were to decide in favor of the latter, I would work without the varnish, and I would use a soft pencil, not too sharp, and make a thin film wherever I wanted it: not with a lace-work touch, but almost like a wash—I can scarcely describe it. The work must be done, oh, so sparingly, or it will show white and crude in the printing; and I would do it, as I said, right on the surface of the negative. But it may sometimes happen that the negative is so thin, right on the under-exposed cheek, that it simply will not take even the softest pencil; and then, the retouching varnish must be used. Of course, it is harder to make flat, undetailed work on the varnish, but it may be done. The stroke must be very light, then: a line here, a bit of stippling there—anything to make the surface resemble the unfocused skin on the rest of the face.

And, right here, let me repeat what a professional retoucher once told me, and what I have found to be true: that if a plate has been intensified and is to have retouching varnish on it, the varnish must be put on all over; otherwise, its boundary lines are sure to print. Now, this does not mean that I use it habitually: I don't think I have uncorked my varnish bottle for six or seven years, at least; but I always keep it, for I never know what may happen. On the contrary, intensifying a plate makes it much easier to work on when no varnish

is used: the mercury deposit makes a ground that any pencil will bite into, and you can use the pencil almost as freely as a brush.

Obvious Advantages

I retouch very few negatives. Most of them go as they are, but it is not bad art to lighten a shadow that is distorting a face from its true likeness, nor to touch out a yellow freckle or two that took black, nor to limit the number of eyes in a face to two, when the sitter insisted on having four. It is all very well to say, "Wait and get your picture over again." Perhaps your bird has flown, or it was an inspiration or an accident, which may never be caught again, and you cannot afford to lose the plate.

Sometimes, too, the retouching must be in the nature of repairing a damaged plate. Perhaps there are two or three spots on it that never got any emulsion on them when the plate was made; perhaps it is cracked, or perhaps the film has been torn. In that case you must set yourself patiently to restoring the negative; with pencil, with brush and lamp-black, however best you can do it.

Working on the Glass Side

I have lately seen an amateur retouch his faces (when it is absolutely necessary) on the glass side of the plate, with what is known as a china-painter's pencil; a crayon-like substance, black, which easily makes a mark on glass. This, of course, will not do for detailed work. But much like it is another way in which I have successfully printed the under-exposed side of a face. I put the negative and paper in the frame and fasten it. Then I wet my finger and get a little water-color paint on it—preferably lamp-black, and dab it on the affected part, glass side, without any care, letting it dry thoroughly. Then I breathe on it, and while it is still moist, I commence to pat it with the ball of my finger, blending and clouding it until it is only a faint, even film. I do not let it cover any sharply defined outlines in the negative; it must only make a shadow over the part that should show up brighter. Then I expose the frame; if it is in the sun, I turn it around several times, to prevent definition of the paint film. If I still want the details in that shadow to be strong, I wait till

Portrait in the Sunlight
Katharine S. Stanbery

Damayanti
Katharine S. Stanbery

the print is about half done, then breathe on the paint again and wipe it completely off, finishing the printing with the plain negative. Of course, this is risky and uncertain business, especially with platinum, and not every print may be a success; still, it is one way, and may be a Godsend when everything else fails.

Of course, we all, once in a while, do a little bit of dodging, deepening skies or foreground, in landscapes, or sunning down glaring windows in interiors or screaming white dresses in portraits; but we do not, if we are conscientious artists, ever print in clouds or try to put anything in a picture that was not there.

But we have, at any rate, the right to do some work on the plate; for as one artist has said, it is folly to think that all his creative responsibility ends when he has exposed and developed the plate.

Spotting

And the finished print does need "spotting," oh! so often. Little white spots, from no one knows where, will show on the platinum surface; or the process of reducing four eyes to two, begun on the negative, must be finished in the print; or there is an ugly high-light in one eye which must come out, or the filled-in scratch has printed white, or a legitimate high light, such as the tip of a sword-handle, a point on a white ruffle, a tiny interstice of sky in the wrong place in the forest darkness, will catch the eye a mile off and spoil the rest of the picture entirely, unless it be toned down; indeed, there may be some very strange and unexpected defects. This does not happen often, fortunately; most negatives will make straight, clean prints.

Well, the great aim in spotting out these defects is to destroy all evidence of them. This must be done slowly, patiently, sometimes with a magnifying-glass. One manufacturer advertises water-color paint for spotting, warm and cold. Well, I have seen it. You might as well buy a spool of black silk and one of white, to do all your sewing with.

In the first place, it is almost impossible to spot a gelatine or collodion paper well, and I am not writing about them, anyway. I am writing chiefly about platinum paper and Eastman's Sepia paper—and gum prints.

Platinum Prints

I never use India ink. Lampblack is just the color of a truly black platinum print; if it is a little bluish in tone, I mix a little bit of Payne's gray with the lampblack; if brown, I use sepia and black. If I have developed black platinum paper with a good deal of mercury bichloride, making brownish-black shadows and yellowish half-tones, I vary my colors to the different tones, sometimes even putting in a dash of chrome-yellow. I work with a small, fairly dry brush, on dry paper; unless—say a linen collar is to be reduced in tone, when I mix my tint (toning it carefully) quite wet, and wash it in broadly, taking care of the edges as they dry, lest they leave a ridge. If the picture is quite black and white, I often take out the little white flakes with a soft black pencil, touching very lightly—a hard pencil will always leave a shiny mark.

Reducing High-Lights

A good way to reduce a high-light in a black platinum print is to go over it with a pointed soft pencil, very, very lightly, in a delicate vermicelli pattern, covering the surface evenly; then to rub this in with the finger. If the work has been light enough and even enough, the result will be smooth and indistinguishable from the rest of the print.

Or, if the picture is bold and sketchy, and there is a high light to tone down, such as a shiny reflection on woodwork, or a highly polished collar, or a glaring spot of white between some trees, then I often use a soft pencil or a finely pointed crayon quite boldly, though delicately, in the manner of an etcher. With brown crayon you can work on brown prints; a pity there are no brown graphites! This is a practice quite prevalent among artists, and it may be very much overdone, or badly done, or inappropriately. One must be sparing with this effect, and discriminating.

Sepia Prints

Eastman Sepia paper prints in so many different tones, depending on the atmosphere, temperature, sun or shade, the temperature of the developing water, the length of time of washing, the strength of the fixing bath and the length of the fixing, to say nothing of the age of the

paper, that one must have a varied palette to spot several pictures printed in one day. Generally, I find that sepia and brown madder make just the tone; but often Payne's gray must be added, or even a little black—occasionally Venetian, Indian or light red. But always sepia and brown madder; the paper is a misnomer, not being sepia-toned at all.

Gum prints, as every gum printer knows, are best spotted by saving scraps trimmed from the edge of the print, soaking them and using the paint from them.

Technique As to the ultimate success in perfectly painting out defects in an imperfect print, that generally depends on the skill and patience of the artist. He must, as a rule, have a good knowledge of drawing and brush-work, to say nothing of the modeling and anatomical perspective to be brought to bear on restoring a blurred or otherwise ruined face or figure. Beside, he must have discrimination and the faculty of imitation enough to make his work of restoration homogeneous with the rest of the pictures, whether realistic or impressionistic, sharp or hazy, clear or patchy; not to model too well and graphically, and never, never to make his pigment any darker than he finds it in other parts of the picture, in corresponding tones, and he must not destroy the likeness.

I do not know why we should not be permitted to do this much to our prints, anyway. It is always deplorable when they do need improvement, and we are rather proud of those that do not; but I would rather spot out a necessary defect, occasionally, than put out the picture with the defect screaming at every passer by, or suppress it altogether.

There is a certain line over which we must not step in the manipulation of our pictures, but I think artists all instinctively know about where that line is. On the right side of it, they may exercise some individuality of their photographic art, a very small proportion of what the painters may use; and, too, they may regard the lens as their tool, and correct its errors, to a limited extent, just as engravers may correct their own plates.

It must not be supposed, however, that a slight unsteadiness of outline, caused by the movement of a

model, is always a defect. Many pictures are beautiful in spite of this; some, indeed, because of it. Sometimes it gives the sense of motion as nothing else could. But it is not an effect to be striven for, as it is not a safe thing to count on, and its beauty should lie in its rarity.

The Mount The mounting and framing of prints is a matter to try the soul, sometimes. I used religiously to mount nearly every print I put in my portfolio, or gave away. But it was an aggravation to select a suitable paper, and generally the game was not worth the candle, as the mounting-paper got broken and dirty and did not always seem to enhance the print anyway. So now I mount very few pictures. When I do, I confine myself to very plain papers. Of course, for a short while I went through the general fashion of putting several various-colored papers behind the print on the large mounting-paper, and getting it up in more or less bizarre fashion; but my soul soon recoiled. Now I confine myself to a few shades of heavy "cover paper," which I buy by the pound from the manufacturers; to the beautiful Florentine papers and other imported stock, Occidental and Oriental, to be had of the Japan Paper Company, and the wonderful so-called "Japanese Vellum," kept both by that company and by Lionel Moses. This vellum is really a tough, almost untearable, yellowish paper, with an almost expressive surface. It is used to print photogravures on, in fine books; yes, and it is used in "Camera Work," too. But whatever paper is used, the greatest care must be taken to have the tone harmonize perfectly with that of the print; a discord is frightful.

Be Accurate I always make my mount a good deal larger than the print (that is another nuisance in keeping mounted pictures), and sometimes I tear the paper with a ruler, and sometimes, if it is the vellum, I cut it with a knife. But the one thing about which I am particular almost to the point of mania, and the thing I would impress on all amateurs, is to get the print and the paper trimmed to perfect rectangles, and to mount the print straight, absolutely straight. Nothing is more offensive than a print crookedly mounted, even if ever so little, unless

it be one crookedly trimmed, with its sides out of plumb with the vertical lines in the picture. How many photographs, real works of art, have I seen spoiled by careless trimming! When I trim, I do not trust to any cutting machine, but do it on glass, with a sharp knife and a ruler. If I doubt that the camera was perfectly level (and so often it has not been), I go to no end of trouble to make the picture so. Suppose I have a little sea scene. I hold it up to the light, and on the back make a pencil mark at each end of the horizon line—exactly. Then, with my ruler, I connect these with a straight pencil line. At either end I apply a tiny square (a transparent celluloid triangle is a blessing in all this work), and draw a perpendicular line, which is generally found to be not parallel with the sides of the print. On these lines I mark off the desired space above and below the horizon, and so get the top and bottom perfectly parallel —then trim accordingly. If the apparent horizon line in the picture is a row of trees or buildings, or a bridge, or anything but a sky line on land or sea, it is not safe to use it as a guide, for it may be in ever so slightly vanishing perspective. The thing to do then is to hunt for a known vertical object: A mast, a chimney, a straight wall, a tree not suspected of inclination; and then to make measurements from that. If there are reflections in the water, even without a sky line, there is an infallible way. On the back of the print, connect a certain point in the reflection with the corresponding point in the original object by a straight line, and square your print exactly by that.

Persiflage

Oh, but I can imagine the fine scorn of some artists who work by inspiration only and have a horror of measurements. Very well, let them work that way if they want to; it is certainly better to be accurate at all times, and not detrimental to the spontaneity of any work: It is only existing defects that draw the attention of the beholders. Why, one of the most beautiful photographs I ever saw, one that was as affecting and moving to me as an inspired poem, was spoiled in this way. A woman was standing in a meadow, at the farther edge of a pool; she was leaning against a young tree, and she and it were

reflected in the water beneath. It was a filmy, misty thing, sad and beautiful; but—at a glance you could see that the lines running from the woman and the tree through their reflections, were infinitesimally tilted; and that brought one back to earth again, making the camera very much in evidence.

As to Frames

But oh, be careful of your picture-frames! If you are sensitive to badly matched colors, gaping corners, acute and obtuse angles thrown in for variety, lumps of paste under the print, specks of wood or goodness-knows-what between the print and the glass (if you use glass), dirt smeared into the surface of the print, the picture put crooked into the frame, or any such trifles, then you must remember that eternal vigilance is the price of perfection—and that even then you are not sure of getting it.

There are some framers whom you can trust, I believe: I know one in New York, but I can't advertise him here. (Good Secessionists know whom I mean, probably.) But usually your picture framing will be one long, continual battle; but it pays to wage it, even at the risk of incurring the enmity of the framer, who may think you are unnecessarily particular and a very hard customer. Try to be forbearing and polite and to keep your temper, but don't take anything but the best work.

I have glass on very few prints—possibly one in a hundred. And only then when it is a light print, mounted, for effectiveness, loose on light paper. I know that platinum gradually absorbs dirt, but I would rather take the chances; for some of the most beautiful pictures of the amateurs—dark, rich prints—have been utterly ruined by the glare of the glass over them: it is ruinous to depth and beauty.

Platinum Printing

As to printing on platinum paper, I have very simple methods. I usually buy my paper, though I make my own occasionally for special effects. I use the Willis and Clements paper, though there are other excellent ones, and their developer. I mix this up stronger than prescribed. A large-sized box has directions to dissolve

the contents in 100 ounces of water. Instead, I put them in a wide-mouthed quart bottle and fill it up with scalding water. The crystals do not all dissolve, but as the liquid is used up I put in more hot water until they do all disappear. Now the advantage of this is that I should be handicapped with a lot of developer of the strength called for by the manufacturers. They probably have in mind clear, fine, commercial negatives of a uniform value, and know that the 100-ounce mixture is best for *them*. But oh what a difference between these and the negatives of the artist-amateurs!

Variations

In THE PHOTO-MINIATURE, No. 40 (July, 1902), *Platinotype Modifications*, there are some directions for "Varying the Strength of Developers" and "The Use of Mercury," which are invaluable to amateurs (pages 162, 163, *et seq.*). This is the only place in which I have ever seen any reference to the possibility of such variations, though I had for years been doing just these things myself. The platinum printer must certainly read those pages. On page 162 it is stated, generally, that contrasty negatives should be very slightly under-printed, and then developed with a concentrated developer, which will even up the print. And that weak, thin negative should be over-printed, and then developed with a much diluted developer, which will give more contrast. So far, so good; but I want to go into some detail concerning these variations in printing and developing and their results. I want to point out that adjustment of printing and development will not always make a "normal" looking print as desired; but also, on the other hand, that more variations may still be secured by this adjustment than are indicated in the article.

Overmuch Contrast

A negative that is too contrasty may be saved by weak printing and strong development, if it is not too far from the normal. But if the high lights are very high and the shadows very thin in detail, this correction will be difficult, because the shadows will demand such very light printing that the high-lights and lightest half-tones will get scarcely any printing at all. If you print the latter deep enough to show at all, the shadows will come out,

under the strong developer, with the details nearly obliterated. Almost the only remedy for exaggerated contrast is reduction of the negative with ammonium persulphate, which attacks the high lights first; and then, sometimes, a very slight intensification with mercury, to bring out the thin details in the shadows.

Weak Negatives

The trouble is still more noticeable with very weak, thin negatives. Long printing and weak development will make these contrasty, but again the high lights (if there are such) will be very pronounced, while the larger part of the picture will be flat and the shadows hopelessly obscured. (Perhaps, to be sure, your negative really needs something like this; the touch of impressionism thus gained may possibly save a detailed and common-looking picture; but it depends on the subject.) If you put mercury in the developer for a slightly flat negative, it will correct the trouble in the same way that overprinting and weak developing will do; the mercury will affect the high lights and lightest half-tones to such a degree (turning them yellow) that they may afterward be eaten out with acid and a normal black-and-white print left. But, the more mercury, the greater contrast; so that you must expect to lose details in your shadows in proportion to the contrast you obtain in this way. If you want to save every bit of detail in the shadows and still get more contrast, you must give your negative a light intensification, which will attack the low tones perceptibly and not do any apparent harm to the high lights. Remember that the action of mercury on platinum paper is exactly the reverse; *it obscures the low tones.* If you want those low tones eaten out in a contrasty effect, however, you must put in a strong over-dose of mercury; and then when you put the print in the acid bath, the high lights and light tones will be ruined—all turned white. (Again, there is the possibility of making a wonderful, dashing sketch in this way—provided your subject calls for it.)

Mercurial Possibilities

This *progressive* action of mercury on the tones of the print is very useful and leads to many possibilities in tone. Sepia paper, already impregnated with mercury, is all very

well, but with it you can get nothing but a brown print. But suppose we take black paper and a good normal negative to work with. If you print it about normally and put a very little mercury in your developer, the high-lights will turn a faint yellow and the acid will make simply a more contrasty black- and white-print. If you put in more, the half-tones will be affected, turning a yellowish brown, but the darker tones will remain black; and now you may either use acid on the print, getting still more contrast, or wash it immediately in water, leaving a two-toned picture that in many instances will be very beautiful — especially in portrait work, where it gives a wonderfully rich, old effect. (Not always, though—you must discriminate carefully.) Now if you put a great deal of mercury in the developer, you will turn the whole picture a sepia-brown, though its brilliancy will be greatly dulled. Wash it just so, if you are satisfied; if you want a little more contrast, immerse it in a very, very weak acid bath, and do not leave it for any length of time; for the acid will always eat out every bit of platinum that is impregnated with mercury in a sufficiently over-powering proportion of the latter to make the tone unstable. This must be remembered even in working with the sepia paper, with plain developer.

Suggestions

Indeed, I seldom use an acid bath for any of my platinum prints unless I am trying to eat out some tones; and then only one bath. It is not true that acid is necessary to the permanency of the print; it is only, in straight black-and-white work, for eating out the excess of iron left in the paper after development, which academic photographers dislike, but which is really beautiful.

Leaving a mercury-developed print in any acid bath for a long time will generally make a perceptible eating out of the high-lights and lightest half-tones; but sometimes, if great contrast is desired, a stronger acid bath will be found necessary. When you want to eat out every half-tone that will possibly come out, the only way to do it is to pour the acid raw on the face of the print and afterwards to give it a thorough washing. But you must remember that there are very few papers that will

stand the corrosion of strong acid, so that you must be very careful in the subsequent washing and drying of the prints. Japanese vellum is especially sensitive, and of course all tissues.

Incidentally, I do not know why the platinum-paper makers and writers on the subject call for hydrochloric acid, C. P. I have been buying this at from 35 to 40 cents a pint for years: a short time ago I decided to try the commercial quality, at 10 cents a pint, and I find it every bit as good. For me: perhaps for professional workers it might not make the high lights as intensely white as they want them, yet I cannot see much difference.

I have covered the ground of these experiments very roughly, as it is not necessary to do more than suggest the principles to a worker of any experience; he can make fresh discoveries for himself each day and he will find what a wonderful range of tones these variations of printing and developing will give him.

Above all: I never float my prints on the developer. Not only does it take so much, but it is really difficult to do them evenly, and the least bit of scum on the surface (especially with a mercury bath) will ruin the prints. Instead, I pour the developer on from a wide-mouthed pint measure (glass), as rapidly and evenly as possible, always shaking it beforehand to break up settlings and scum. Sometimes I brush the developer on, with a little glycerine to insure evenness, and this is economical; but glycerine flattens the tone of any print, and it is hard to work without it. Never on any account put platinum developer in a tin can or measure, even to pour it from, a chemical change takes place at once, which will ruin the print.

Home-made Platinum Paper

Very often, when I want some special effects, I make my own platinum paper. Not that the commercial article is not good enough, for it is: and more uniform and fully as cheap as what I can make myself. But it comes in only one or two kinds of paper, and that is confining an artist within very narrow limits of expression. Even if you could order it on any paper that struck your fancy, you would not want enough of one kind to warrant the order. And there is a great joy in being able to coat

an attractive piece of paper and get a print from it all within fifteen or twenty minutes. The books that describe the process nearly all do it with a warning not to try it: They say it is to be made in large quantities, with perfect equipment and facilities, and that it is impossible to do it in a small way. But it is possible—and practicable.

In No. 40 (Platinotype Modifications) of THE PHOTO-MINIATURE, already quoted, the editor published a letter I wrote him in which I described my method. Not expecting the letter to be published, when I wrote it, I had referred him to Woodbury's *Encyclopedic Dictionary of Photography*, for the formula I used, as I had taken it from that book, and he included the quotation, *verbatim*, in my letter. I am now going to give it in my own words; indeed, I think I can make the whole process more concise, and, in parts, more full, than it was given in No. 40.

Paper

First, the paper. Anything will do. Writing paper, drawing paper, cover paper, tissue, special papers of all sorts—anything or everything. But there is, of course, a great difference in their treatment.

Tinted Papers

When you coat colored papers, especially yellow, be sure to test them with hydrochloric acid to see if it will bleach out the dye in the paper. If you put a print on yellow cover paper into the acid bath, you may have the pleasure of seeing it come out perfectly black-and-white. In such cases it is best not to use the acid bath at all, or if you think it is absolutely necessary, make it very, very weak and leave the print in it but a few seconds.

Regular Grained Papers

When you put your own platinum coating (or gum either, for that matter) on charcoal paper or any paper that shows a definite direction in its grain, you must be very careful in putting the paper into the printing-frame, to see that the grain squares with the sides of the picture as it is to be when it is finished. It is not enough to put the crosswise rib (say) perfectly parallel with the top and bottom of the frame or of the negative. Perhaps the negative itself is out of plumb and must be corrected

(as I have already suggested) in the trimming. Well, no amount of trimming in the world can make such a print look right if the grain has followed the edge of the negative: It will always look like a ship at sea and be an eyesore. The only way to do, in the case of a crooked negative, is to cut the paper slightly narrower, so that it may be turned in the frame, and then to adjust it carefully and accurately, making the grain square with the vertical and horizontal lines in the negative. But one must be accurate—a slight deviation is just as bad as a great one. Even when a diagonal-grained paper is used, such as the heaviest Whatman, the grain must run at an angle of just 45° to the vertical and horizontal lines in the negative, or the print will set your teeth on edge every time you look at it: If you don't believe it, try it and see.

Sizing

Of course it is desirable to use papers that require the least work—that is, those that need no sizing. If the paper you select absorbs moisture in any degree, then it should be sized—otherwise not, and, fortunately, most of the drawing papers and cover papers, and above all, the Japanese vellums, do not need it. Paper that is moderately absorbent will need one coat of sizing; Japanese tissues, two coats, and the thin, bibulous tissues, three. I here give the formula I use—my own proportions:

Water, 15 ounces; gelatine, 75 grains; alum, 75 grains; methylated spirits, 3½ ounces: Dissolve these in the given order and filter the mixture.

This may be made in a larger quantity and kept a long time. I do not float my papers as it takes too much sizing and makes them so wet that it is hard to find a good place to hang them to dry. I lay them on a large piece of paper and brush the sizing on carefully with a wide, flat brush; both sides, of course, so that they will not curl, but one at a time, so that they may be dried on the paper without being hung up. If a thin tissue is to be sized, I pin it down by all four corners to a heavier piece of paper, and finish all the coatings on one side (drying thoroughly after each one) before I turn it to the other. I never take a piece of paper very much larger than my largest plate (8 x 10 inches).

Of course, it must be remembered, however, that while many papers need no sizing at all to take the coating, yet many of them will bear more brilliant images if sized. It would be of no advantage to size the heavy Whatman drawing papers, nor some of the hard cover papers and charcoal papers; while the heavy, smooth Japanese vellum has already such a wonderful texture that I always want it to be in evidence, free from any suspicion of sizing. I did coat a piece of tough brown Japanese tissue, the other day, without sizing, and it took the coating and printed beautifully; but there was no brilliancy, everything having sunk into the paper. But I know that if I had used a brilliant negative, developed with mercury and used acid, the result would have been good; especially with a coating solution strong in potassium chlorate.

Sensitizing

As to the sensitizing. Three solutions are to be prepared, as follows:

I. Hot water, 1 ounce; oxalic acid, 8 grains; ferric oxalate, 120 grains. II. Hot water, 1 ounce; oxalic acid, 8 grains; ferric oxalate, 120 grains; potassium chlorate, 2 grains. III. Water, 1 ounce; potassium chloroplatinite solution, 80 grains. [Or water, 1½ drams; potassium chloroplatinite, 15 grains. Many buy the platinum in 15-grain bottles.]

I must first discuss these chemicals. Take care that the dealer does not give you Ferrous oxalate, as I have known dealers to do. Your object in the platinum process, is to reduce ferric to ferrous by the action of light; if that be already done for you, you will get no picture. The label must read, either "Ferric oxalate," or "Oxalate of iron (ferric). The same care must be exercised about the platinum. It must read, either "Potassium chloroplatinite" or "Potassium chlorate and Platinum:" never "Potassium chloroplatinate." This mistake, too, has been made. The Ferric oxalate comes in greenish gray scales, in brown bottles, as it is so sensitive to light; the platinum salts—in tiny red crystals, impervious to light. The plain Potassium chlorate, added to number I, to make number II, is to produce contrast. Keep these in brown bottles.

I have never used distilled water—only the regular

river-water. But for I and II it ought to be hot; indeed, cooking the mixture will dissolve the scales much quicker. It has been suggested to me to put in the oxalic acid (the preservative) before the scales, in order that there may be no chance of deterioration, and it is an excellent idea.

Accuracy in Weight

A very important thing to remember in the buying and using of potassium chloroplatinite is its weight: in any quantity of a dram or more you buy is by avoirdupois, and you always use it by troy. The avoirdupois ounce contains $437\frac{1}{2}$ grains; the troy, 480. If you call for—say two drams of the salt, you will get a bottle labeled "one-fourth ounce," which will contain, instead of 120 grains, only 109.375 grains. So that instead of taking 1.5 ounces of water to the bottleful, without weighing it, you must take a little less than 11 drams of water theoretically: the full 11, practically, as you will generally find an even 110 grains in the bottle. At any rate, it is always best to be on the safe side by weighing all chemicals accurately, even when they are put up in the desired quantity by the apothecary. For I once knew of a drug clerk who put up some photographic chemicals in small powders for an amateur, and who, when the formula seemed to go wrong, admitted that he had been throwing in a few extra grains just to give generous measure.

Coating

To do the coating, use a broad, flat and (especially) thin camel's hair or sable brush; camel's hair will do, but the sable is somewhat nicer and softer. Provide yourself with four chemically clean medicine droppers, with openings giving drops of uniform size. Also with a saucer, a glass of water, a larger receptacle for water to wash your brush in, and your sized or unsized paper, with a piece of pasteboard or something of the sort to pin it to. Range your solutions on a table, in this order: I, II, III, water, with a marked medicine dropper for each one. Sit at the table, with the shades down, if it be daylight—all the light you want if it be night. Mix the coating in the saucer *for* each sheet as you need it. The principle or the formula is this: There are to be

24 parts of platinum to 22 parts of iron oxalate (plus some water); but the iron may be composed of any proportion of I to II—more of II giving greater contrast. To illustrate, I will give the four formulas from *Woodbury's Dictionary*, with the given descriptions, substituting, however, my "drops" for his "drams."

No. 1. "This should give very soft and deep black prints." I, 22 drops; III, 24 drops; water, 4 drops.

No. 2. "If greater brilliancy is required, the following is recommended." I, 18 drops; II, 4 drops; III, 24 drops; water, 4 drops.

No. 3. "When results corresponding to silver images are required, the next solution is recommended." I, 14 drops; II, 8 drops; III, 24 drops; water 4 drops.

No. 4. "For very weak negatives, reproductions of engraving, etc., use—" II, 22 drops; III, 24 drops; water, 4 drops.

You see it is always 22 to 24: The amount of water does not make a very great deal of difference—a little more or less. This formula, by drops, is about enough for a piece of paper measuring, roughly, 9 by 11 inches. Coat the paper first and trim it afterward; and mark the proportions of I and II that you use on the back, before coating, for futurer eference. You may, besides, vary the proportions of I and II just as you please. Drop the ingredients in the saucer, with the medicine droppers, and mix them by agitation; do not put in the brush until they are fairly well stirred up. (This because the brush would first absorb them unequally.) Have the brush wet to begin with, though carefully drained off. Pin the paper down by one or two corners, take a generous brushful and apply it with broad, smooth strokes, first up and down the sheet, next, transversely. Be as expeditious and work as evenly as you can, but remember that it does not require half the care that gum coating does, for there is no gum to set, and you can work over and over for a little while, putting on fresh brushfuls. Not too long, however, or the wet sensitizer will quickly deteriorate, and you will get only a faint or a patchy image in the printing. The brush should be washed after every using, and the wash water frequently changed. *This is very important.*

Making Allowances

In measuring out the drops for a sheet of paper, allowance must be made for the grain. A very coarse-grained paper will take much more sensitizing mixture than a smooth one will. The very heavy Whatman paper, which has a diagonal grain, takes about once and a quarter as much liquid as a smoother paper, for every pore and hollow must be filled, and thoroughly. On the contrary, the smooth Japan vellum takes less than the usual run of papers.

Allowance for the grain must also be made in printing. If rough-grained paper is exposed in the sunlight, the frames must be turned from end to end and from side to side, occasionally, or the heavy corrugations will cast strong shadows, which will not print so dark as the rest. Better still, prop the frame so that the sun's rays strike the negative at right angles, and then there will be no danger of blurring the focus. See the paragraph on rough papers given on pages 553-554 for other hints on this detail.

Drying

To dry the paper, first let it hang—or lie—in the same temperature, till the surface moisture has disappeared spontaneously. Then hang it near a gas jet or a heater (away from actinic light), just hot enough to get the paper "bone dry" in from five to ten minutes from the time of coating. I quote Woodbury's warning: "Not less than five nor more than ten minutes should elapse between the coating and drying operations. If it becomes dried too soon the image will probably wash away in the developer, and if not dried quickly enough the picture will be flat and sunken in." The first stage of drying must last for five minutes any way.

Store the paper in empty platinotype tubes, if you make more than you need, and use the preservative. Woodbury recommends development with oxalate of potash: 1 pound dissolved in 54 ounces of hot water. I have used this, but generally use the Willis and Clements developer, as it is always on hand.

Now this is supposed to be a hot bath process, but I find that cold developers works just as well as it does on other papers.

Sepia Paper To make Sepia paper, I know of no other way than putting mercury bichloride in the sensitizing solution. I don't know what the makers use. I make a concentrated solution of mercury bichloride and water, and use it instead of plain water in the formulae. But to get enough to make the paper *very* brown may weaken the solution too much, in which case a greater or less amount may be put in dry; but then it will take some time to dissolve, and the brush must never be touched to it until it is thoroughly dissolved. If used in solution, an extra medicine-dropper must be provided and never, never be used for anything but the mercury solution.

In addition to these directions, I advise any one that attempts this process to read the whole of Mr. Woodbury's article, for general information, and also the directions in THE PHOTO-MINIATURE, Number 7, for November, 1899. There may be better formulæ than those I have used: I stick to them from habit and because they satisfied me. Others may develop new and better ideas. You may, probably you will, have some failures, for I had many, at first; but it is worth while to persevere.

As a rule, home-made platinum paper is somewhat slower in printing than the commercial article. Once in a while it is a trifle uneven in the coating. But these drawbacks are more than offset by the immense advantage obtained by having a picture on any kind of paper you want, and coated with any degree of contrast; besides, the occasional irregularity has often produced the most artistic prints. Instead of the old brush and glycerine process to produce a vignetted effect, it is possible to get it in a much more artistic way by coating your paper only partially, finishing the desired edges with rough brush marks.

Rough Papers Be careful, in coating rough or ribbed paper, to get enough liquid, and to spread it on very thoroughly and evenly; and be careful that your ferric oxalate has not deteriorated, and (especially) that your paper dries in not less than five minutes, nor more than ten. This applies to both sepia and black platinum papers.

Tissues

One more thing: how to print thin tissues. After the last coat of sizing, never remove the paper from its support until the picture is ready to be pressed and trimmed. Sensitize and dry it while it is still pinned down to the white paper, and put it in the printing frame with the paper behind it (though with the pins out). This is necessary in order to examine the image from time to time. When it is out, pin it down securely again before putting it in the tray and pouring on the developer; if you must use acid, use it weak, and do not wash the print in violently running water. The tendency of tissue is to curl up and (for some kinds) to get pulpy in water; and it is almost impossible to straighten it out again. If a pin comes loose and a corner flaps over during the wet processes, let it go until the print is almost dry—don't try to straighten it while it is wet.

The Principle

Of course it must be understood that the principle of platinum-printing is the formation of an image by the action of light on ferric oxalate and its reduction to ferrous oxalate; and the substitution of a platinum image (platinum in a salt form being present in the sensitizing solution) by the action of some such agent as potassium oxalate, which not only precipitates the pure platinum in the place of the ferrous oxalate, but washes away everything else—iron, potassium chlorate and all. Only a trifling amount of iron is left, which hydrochloric acid will eat away; but it is not thought to be detrimental to the platinum image, nor, by the later chemists, is mercury bichloride.

Platinum Influenza

I must warn all amateurs who make their own platinum paper to guard against what I might call, for want of a better term, "platinum influenza." I do not know if it be the metal itself or its compound with chlorate of potash; but at any rate, if you work over it when it is either dry or wet, with a lack of fresh air, you will find that it affects the membrane of the nose and the eyes very seriously. First you will commence to sneeze unexpectedly and will keep it up; then your eyes will run, and if you do not get some relief you will soon be in a serious con-

dition. But if you work in a room not too hot, with a window open, and if you move about frequently and get plenty of fresh air, all this will be obviated.

Storage of Paper

Although my negatives are all 8 by 10 inches, I have invested in two or three tubes of 10- by 12-inch paper (Willis and Clements, and Eastman's Sepia), in order to store properly the paper I make myself. For I usually cut my paper a little large, to get good coating, and I do not like to trim it until just as I use it; for in the case, say, of charcoal paper, with heavy vertical water marks, I may be able to save one of them from running through an eye or other sensitive feature, by trimming to the right or the left, as the case demands. I save all preservative from commercial platinum paper, and appropriate it to my own use. I quote the makes of paper above, to call attention to the fact that the Eastman Sepia can is quite a little wider than the Willis and Clements, and therefore better for storing stiff, heavy paper in. Strange to say, the Willis and Clements 10-inch cans are narrower across than the 8-inch ones!

Blueprints

Ferrocyanide prints make very good pictures, sometimes, for decorative work on a small scale — especially Kodak landscapes. But one may waste blue paper very effectually, as well as more pretentious material—often when it is scarce; for the exposure is sometimes hard to gauge. I have never yet found a remedy for under-printing, though there may be one. But there is one for overprinting. When a print is overdone, I first wash it thoroughly and then immerse it in a tray of water to which a few drops of ammonia have been added. It will turn purple, and the reduction will commence immediately. This should be carried as far as the eye will judge of, should no artificial restoration of color be intended. If carried too far, the half-tone will turn yellow and the print be ruined. I do not wash the print long, as this reduces it much further—I simply rinse it. When it is dry, it will be found to have returned to almost its original color—a little purplish.

But if I want it a bright blue again, I reduce it a little too far, even if some of the light tones do turn a

bit, rinse it, and then plunge it into another tray of water containing a few drops of hydrochloric acid. The print now turns a brilliant blue-and-white, and is much more contrasty than a simple correct printing would have made it. It is then to be washed, of course.

Therefore, I purposely overprint, reduce and intensify blue prints from flat negatives. By the way, I have read how to turn blue prints black with tannin or tannic acid, but I have tried it and never succeeded.

KATHARINE S. STANBERY.

Notes and Comment

With the publication of this issue we complete Volume VIII of THE PHOTO-MINIATURE, Nos. 85–96 inclusive. The title page and index for the volume are now in preparation and will be sent, on publication, to all who apply for copies and enclose a 2-cent stamp with the application.

The January number of THE PHOTO-MINIATURE, now in press, will deal with the new and remarkable possibilities opened up by the many small cameras now appearing in the market. The writer of the monograph is an amateur of considerable skill and experience, who has devoted much time and money to a careful investigation of pocket cameras and their practical efficiency. His story abounds with live interest and is well illustrated.

"With a Kodak in the Land of the Navajo" is the title of a charmingly illustrated story by Frederick I. Monsen, lecturer and traveler. Published by the Eastman Kodak Company, and obtainable from the nearest Kodak dealer. Ask for it before the edition disappears.

Time was when the photographer in buying chemicals asked for "soda" or "hypo" et al, and accepted what was given him without question. Today, however, he wisely insists on standard purity and quality, buying the products of chemical houses of known reputation. Among these the Powers-Weightman-Rosengarten Company of Philadelphia holds a foremost position, and the reader of THE PHOTO-MINIATURE who will insist

on the P-W-R brand when purchasing chemicals is assured of the best in the market. A complete list of the products of this firm can be had on request and it is a handy list for reference as well as for buying.

"Agfa" Blitzlicht comes to the front again with new possibilities by reason of the introduction of the "Agfa" Blitzlampe (Berlin Aniline Works, 215 Water Street, New York). The excellence and advantages of "Agfa" Blitzlicht, like good wine, need no bush or "boost" as we moderns pronounce it; but the "Agfa" Blitzlampe, as something new, deserves a word of comment. Briefly it is the handiest and most practical flashlamp we have yet seen, minimum in size and maximum in capacity; fitting the vest-pocket but equal to all the ordinary requirements of amateur use at home. In use the "Agfa" Blitzlampe is held in the hand. No alcohol or caps are needed, an ordinary Swedish safety match igniting the powder when a spring catch is pressed by the thumb. It is a marvel at the price—80 cents complete. See the new booklet "Agfa Blitzlicht in the Home" for instructions in the making of flashlight pictures. A copy can be had for the asking.

Those who make their own platinum, gum or blue paper will find in Strathmore Water Color Paper (Mittineague Paper Company, Mittineague, Mass.) a most desirable base for pictorial effects. This paper is available in four surfaces and two weights, covering a wide range of requirements. Sample sheets and prices, together with specimen books of the beautiful cover or mounting papers made by this firm, can be had on request from the Mittineague Paper Company, and no progressive photographer can afford to overlook them.